PAN BULLAN B SCH BANGE

MAY . 350 Monthly

U.S. Scientist Sets Timetable to Moon

> Take-Along Check or padging a Used Car

Extra: Valuable Booklet



"I cleaned and waxed my car in 58 minutes



with Du Pont's NEW CAR WAX



...it's still gleaming-bright 6 months later"

says Charles J. Rockwell, of Paramus, N. J., after waxing his '56 Plymouth with Du Pont New Car Wax. "Rocky" found that this new paste wax is as easy to use as a liquid polish, because it cleans, waxes and glazes—all in one easy application. And it protects with real Carnauba wax, the toughest wax known. Proof of protection is the long-lasting gleam. Six months, 10 car washings later, the finish still shows clear reflections of "Rocky" and his wife! Try Du Pont New Car Wax—it makes any good finish look new. At service stations and auto supply stores, Only \$2.00.





Start him toward success

with the authoritative, easy-to-understand

BOOK OF POPULAR SCIENCE





This could be one of the most important investments you will ever make for your child. It will give him a basic foundation in the sciences. It may even spur him on to a brilliant scientific career.

Only science library of its kind. The Book of Popular Science is much more than an encyclopedia. Like a good teacher, The Book of Popular Science makes "complicated" subjects crystal clear and exciting. It is up-to-date and remarkably complete.

Takes your child through 15 major The Universe cover ASTRONOMY and ASTROPHYSICS. 37 chapters on The Earth cover GEOLOGY, MINER-ALOGY and METEOROLOGY. 18 chapters on Life cover MOLOGY. 81 chapters on Plant Life cover BOTANY. 55 chapters on Animal, Marine, Bird and Insect Life cover zoology.

21 chapters on Man cover AN-

THROPOLOGY, GENETICS, PSYCHOLOGY and PHYSIOLOGY, 42 chapters on Matter and Energy cover PHYSICS and CHEMISTRY. 45 chapters on Industry cover METALLURGY and many branches of ENGINEERING.

Plus: Transportation (AERONAU-TICS, ASTRONAUTICS, and AUTOMO-TIVE ENGINEERING); Communication (ELECTRONICS, PHOTOGRAPHY, etc.); Health(HYGIENE and MEDICINE); Science Through the Ages; Society (ANCHAEOLOGY and SOCIOLOGY); Science In the Home. Also, 21 chapters of exciting Projects and Experiments to give your child the satisfaction of "doing it himself."

Contributors include 99 eminent acientists and educators, such as: WILLY LEY, America's foremost writer on rockets and space travel. SAMUEL L. BOOTHBOYD, Professor of Astronomy, Emeritus, Corneil University, DR. KARL M. BOWMAN, Prof. of Paychiatry, Univ. of California School of Medicine, DR. LEE DE FOREST, pioneer electronics inventor. DR. THEODOSIUS DOBZHANsky, Prof. of Zoology, Columbia Univ. Dr. BENTLEY GLASS, Assoc. Prof. of Biology, John Hopkins Univ. DR. EARLE H. KENNARD, Prof. of Physics, Cornell Univ.

It is like having 99 distinguished ecientists and educators in your home, to teach your child science!

FREE Booklet of Experiments!

The LITTLE Book of Popular Science describes 12 scientific experiments that your child can do himself; teaches him about atmospheric pressure, molecules in motion, refraction of light, etc. Shows

him how much fun it can be to learn about science. For free copy, тай сопроя right now.



Read this excerpt from a review in

"SCHOOL SCIENCE & MATHEMATICS"

(Journal of the Central Assoc. of Science & Math Teachers, Inc.)

"The reviewer put The Book of Popular Science into use for more than two months. It was eminently clear that the publication was excellent ... The contributors ... read like a 'Who's Who of the Scientific World' ... without question up-todate ... adequate coverage of the newest scientific innovations ... an indispensable item .: ."

(from the January, 1958 issue).

THE GROLIER SOCIETY INC. . FOUNDED 1895 PUBLISHERS OF THE BOOK OF KNOWLEDGE*

The Grolier Society Inc. (Science Division) 2 West 45th Street, New York 36, N. Y.

I would like a free copy of "The LITTLE Book of Popular Science," without obligation.

There are	_children	in my	family,	ages

ZONE_

Popular Science Monthly, May, 1958

STATE

C The Groller Society Inc., 1988.

Popular Science Monthly

May, 1958



Look, no hands! Will the car in your future drive like this one, guided by radia? PS gives you a peek at tomorrow



We're closer to getting to the moon than you may think, says Dr. I. M. Levitt (above and on front cover), director of Philadelphia's Fels Planetarium. Here's the schedule

AUTOMOBILES

The Car That Drives Itself · 75
Driver's Report on Saab and Volvo · 98
Favorite Short Cuts to the Junkyard · 189
What Is a Tune-Up? · 193

USED-CAR BUYER'S QUIDE

Is There a Used Car in Your Future? · 167

Complete Tear-Out Booklet:

Used-Car Checklist · 171

I Check 40 Used Cars a Week · 183

CONSUMER NEWS

Suddenly Everybody Wants a Telescope · 94
'58 Outboards: Facts and Figures · 157
What's New · 162
For the Home Shop · For Your Car
For Your Home · For the Handyman
Just for Fun

WORLD OF SCIENCE AND INDUSTRY

Navy's New Quick-Trigger Missile · 80
What We're Learning from Satellites · 84
Strange Shapes for the Space Age · 88
Trials of the Jet-Age Traveler · 93
Timetable to the Moon · 102
What Science Has Done for Your Dog · 107

Managing Editor FRANK ROWSOME JR.

Assistant Managing Editors Charles M. Garvey Kendall W. Goodwyn Robert P. Stevenson

Senior Editors
Devox Francis
Martin Mann
Everett H. Ortner
Harry Walton

Technical Editor
Hubert Luckett
West Court Editor
Wesley 5. Griswold

2 POPULAR SCIENCE

Editor: HOWARD ALLAWAY

America Editore

Erik H. Arctander
Alden P. Armegnee
Henry B. Comstonk
Frank Durz
Sheldon M. Gallagur
Herbert O. Johanson
Herbert R. Pfister
Maryann Smith
Ruth Westphal
Richard A. Yahrasa

Editorial Assistants

Ross Los Beeland (Chief) Anna Dallas, Bebe Lipson, Roberta Marka Georgette Sparks Art Director HOWARD C. JENSEN

Art Editors

Herbert Authory Reginald A. Hawley Harry Samuels

Art Associates

Eric A. Karminski Jr. Henry W. Karmirowski Richard J. Meyer Dana B. Rasmussen

Photography

W. W. Mozzis (Chief) Robert D. Borst Orlando Guerra

America's Leading New-Idea Magazine for 86 Years

SPECIAL FEATURES

How to Boost Your Test Scores • 126
The B-47 That Couldn't Come Down • 130
The Amazing "Tote" • 135
Ordering a House from the Factory • 150

Gus Meets a Master Mechanic · 198

Hi-Fi Dictionary · 203

PICTURE NEWS

Army Jeep Turns to Skyriding • 110
Rockets Propel This Torpedo • 116
Gls Wear Paper Suits to Fight Fires • 123
New SeaMaster Is Tested • 125



"Bow Legs Control ... I'm at 13.500 and I'm going to 16.000 before I turn the power off ..."

FOR HOME AND SHOP

Hiding Plywood Edges · 142

PS Shop Note Book · 147

PS Fix-It File: Casement Windows . 155

New Saw Has Many 'Firsts' - 166

Hints from the Model Garage . 187

Short Cuts and Tips · 209



Say good-bye to those plywood layer-cake edges. PS shows you how the pros finish them off

EVERY MONTH . . .

PS Readers Talk Back • 4
The Month in Science • 11

Keeping the Home Shipshape - 14

Prize Projects by PS Readers - 16

I'd Like to See Them Make . 18

You Ought to Know . 21

New Ideas from the Inventors · 139

Wordless Workshop · 148

Publisher RALPH H. FLYNN

Advertising Manager Lee P. Adams

Circulation Director
EUCENE WATSON

EDITORIAL OFFICES: 353 Fourth Ave., New York 10, N.Y.

ADVERTISING OFFICES:

NEW YORK-353 Fourth Ave.
CHICAGO-360 North Michigan Ave.
BETROTT-820 Book Bldg.
BAN PRANCISCO-114 Sansome St.
CLEVELAND-636 B. F. Keith Bldg.
LOS ANGELES-711 South Vermont.
PORTLAND, GRE.-520 S.W. Sixth Ave.

SUBSCRIPTION SERVICE:

Address all subscriptions and correspondence concerning them to: Popular Science Subscription Department, 353 Fourth Ave., New York 10, N. Y. Allow four weeks' notice for change of address. Please give both old and new addresses, including tone numbers. Published monthly at 353

Fourth Avenue, New York 10, N. Y., by Popular Science Publishing Co., Godfrey Hammond, Chairman of the Board; Ralph H. Flynn, President and Treasurer: Franklin E, Parker Jr., Secretary; Eugene Watson, Vice-President, Second-class mail privileges authorised at New York, N. Y., and Dayton, Ohio, Entered as second-class matter at the Post Office Department, Canada, Printed in U.S.A. Copyright, 1938, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all the countries participating in the International Copyright Convention and Pan-American Copyright Convention. Single copy 35c. Subscriptions to United States, its possessions, and Canada, 1 year \$3.40 (2 years \$6.00. I years \$8.00). Elsewhere, 1 year \$6.00 (2 years \$11.00, 3 years \$16.00).

MAY 1958 3

PS Readers

TALK BACK

Studying by Mail

THE February article "Plain Facts About Correspondence Schools" inspires me to add my own few words. Recently I signed up for a course in accounting and I have never once regretted it.

Home-study courses aren't miracle drugs. They can't teach you what you are



unable to comprehend, and they demand a great deal of time and effort. But I don't know of any better way for a man to spend his spare money or his spare time. After all, he is investing in himself and in his future. I would, however, recommend caution to those who might choose a course too remote from the type of work they are doing or beyond their educational background.

DAVID R. HANDS, Ottawa, Ont.

course by mail in two years of hard studying. I gained a lot of theoretical knowledge, and, with some common-sense thinking and the course's step-by-step instruction in different circuits, I have learned to do a job well. It would have been easier in a classroom but with a family to rear you have to stay on the job. Still, after the day's work there are four hours or more for studying each night. Without correspondence schools, I would never have been able to take the course.

M. Campau, Pine Bluff, Ark.

Tomorrow's Engineers?

How about an article against the President's plan to stop federal aid to vocational schools? As the mother of sons who go to this type of school for pre-engineering training, I am deeply concerned. I think these schools are wonderful. Time is divided half-and-half between academ-

ics and courses in practical mechanics.

The head of one of the largest automobile concerns has said that if he were hiring the engineers, he would hire only those who had worked as mechanics for four years.

I hope many of your readers will write their Congressmen to vote against removing federal aid to vocational schools.

MRS. JAYSEN, NYC.

For some years the federal government has allotted a big share of its educational budget to vocational schools—roughly 15% of those schools' expenses.

The President's tentative budget does indeed omit further aid. But Congress has the final word and it has long been a warm supporter of vocational education.

New Cars 'Slapped Together'?

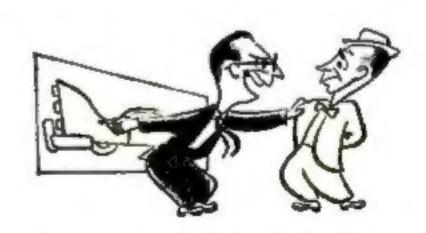
MAYBE the assembly lines could turn out a sturdier car if so much money wasn't spent on spying out the competition's next move [How the Auto Makers Spy on Each Other," Feb.].

Factory-built defects are the growing cancer of the automobile industry and the main reason why we have been getting less actual car value for more money each year.

R. BLAGDEN, E. Hampton, Conn.

Wanted: Sense AND Style

MAYBE the voice of the people will be heard in Detroit ["Are They Building the Car You Want?"—Jan.] at long last.



They talk about "standard" and "stripped-down" models, but isn't it about time that somebody made a "common-

Ceptignation

BIG REWARDS

for Industry's Most-Wanted Men



Chemical Lab Technician.



Elec. Engineering Technician



Radio-TV Technician



Auronautical Technician



General Electronics Technician



Industrial Electronica Technician

With the right training, you can qualify for big-pay jobs in these vital industries. Start yourself on an exciting, rewarding career and at the same time help fill a desperate need. I. C. S. can

show you how! I. C. S. spare-time training is recognized and used by leading companies throughout the U.S. and overseas. Send today for full details including three free books:

- "How to Succeed" 36-page guide to advancement.
- 2. Opportunity Handbook in field of your choice.
- Sample lesson (Math) to demonstrate I. C. S. method.

For Real Job Security-Get an I. C. S. Diploma! I. C. S., Scranton 15, Penna.

According Member. National Home Study Council



INTERNATIONAL CORRESPONDENCE SCHOOLS (Partial list of 257 courses) BOX 49314E, SCRANTON 15, PENNA. builty basided phaset the field DEFORE which I have marked X (plus semple furson): of each or chilgotion, send me "NOW to 2000EEE" and the uppe ☐ Good English
☐ High School Mathematics
☐ Short Story Writing CIVIL ENGINEERING | Industrial Electronics | Practical Radio-TV Eng's | Practical Telephony | Radio-TV Servicing ARCHITECTURE AVIATION Aero-Engineering Technolog

Aircraft & Engine Machanic Civil Engineering
Construction Engineering
Nightery Engineering
Professional Engineer (C
Interfessional Engineer (C
Structural Engineering
Serveying and Mapping CONSTRUCTION Civil Engineering Construction Engineering Air Conditioning DESCRIPTION OF THE PERSON OF T LEADERSHIP Architecture Accounting Advertising Business Administration Industrial Forenanskip Arch. Drawing and Professional Engineer (Civil) MAILMOAD Industrial Supervision Personnel-Labor Balations Designing Building Contractor Building Estimator Standing Struc, Blumprints Car Inspector and Air Brake
Diesel Electrician Business Management Supervision Diesai Engr. and Firemen Cost Accounting Corporary and Miliwork Corporary Forence MECHANICAL Creative Salesmanship Digast Locometive Diesel Engines
Gas-Einc. Welding
Industrial Enginee
Industrial Instrume
Industrial Metaller
Industrial Salety
Machine Design
Machine Shop Pres reundlied a 2 mail gran Aircraft Drafting Professional Secretary Public Accounting Purchasing Agent STEAM and Interior Decoration **Architectural Drafting** DIESEL POWER Combustion Engineering Industrial Engineering Painting Contractor Dentting Macking Davigs Combustion Enginer
Dense Plant Engine
Stationary Diesal En
Stationary Fireman Clectrical Drufting
Mechanical Drufting
Sheet Metal Drufting
Structural Grufting Plymbing Industrial Instrumentalism Saleramanship Power Plant Engineer Reading Arch. Musprints Mechanical Drafting Industrial Matallargy Salesmanship and Stationary Diesal Engy. ART Commercial Art Sheet Metal Drafting Management
Traffic Management Machine Design Machine Shop Practice Gommercial Art
Magazine & Boo
Show Card and Magazine & Book Illam. CHEMICAL
Assistical Chemistry
Chemical Engineering
Chem. Lab. Technician
Elements of Mucleur Energy TEXTILE ELECTRICAL Muchanical Engineering Cotton Manufacture Cotton Manufacture Cotton Warping and Weaving Electrical Engineering Sign Lettering

Sketching and Painting Professional Engineer (Mech) Elec. Engr. Technicum Quality Control Elec. Light and Power Reading Shop Bluoprints Losm Fixing Technicism AUTOMOTIVE Practical Electrician Refrigeration and Textile Designing
Textile Finishing & Oyeing Automobiles General Chemistry Practical Lineman Air Conditioning Auto Body Rehaliding Matural Cas Prud, and Trans. Profuncional Engineer (Elec) Tool Design | Tool Making and Bulintehing Petroleum Prod. and Engr. Throwing RADIO, TELEVISION Coneral Electronics Tuch. Watping and Weaving Worsted Manufacturing Auto Engine Tone
Auto Technicias HIGH SCHOOL Professional Engineer (C) Pelp and Paper Meking High School Digitaries Consider recidents and coupes to International Correspondency Schools, Consider, 18d., Occupation Montreal, Canada. . . . Special tailties calus to anumbers of the U. S. Arrand Forces.



For the craftsman or hobbyist who is proud of his skill, a handsome goldplated clasp designed by a leading jewelry manufacturer. A \$2.00 value...
yours for 75¢, post paid. Write Crescent Tool Co., Jamestown, N. Y., Dept. S.



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

FOPULAR SCIENCE

hex or round objects with

powerful leverage. Ad-

justs to four positions

up to 11/2" capacity. It has

no rivet projections and

measures only 1/2" at its

thickest point. Finished in

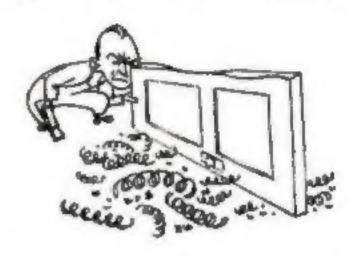
rust-resistant zinc plate.

sense" model—one that would have style in a conservative manner? How about a car that wouldn't start rusting through inside of a year, that wasn't so overloaded with grillework that the front end practically drags, and that doesn't need an ejector seat to get you out and onto the curb? And couldn't we get some locks that wouldn't freeze up in a sleet storm?

LLOYD N. BENNER, Brunswick, Me.

Plane-Guiding Guidance

TELL Donald Snyder, who wants a jack plane with an extension ["I'd Like



to See Them Make," Feb.], that the Bratton Co., Edwardsville, Kan., has a better invention than his for this purpose. The Squar-Ezy plane guide, it has a roller that moves along the face of the board.

RONALD H. HALL, Bethel, Kan.

... One of the tools we sell, the Handyman's Helper, is just the tool Donald Snyder ordered. It not only does what he asks for, but allows beveling at any degree and fits any plane, right- or lefthanded.

> Fox of Green Bay Green Bay, Wis.

... I have been using an extension on my plane for over a year and use it for planing doors. I made it from a scrap of aluminum and a piece of 1/4" plyboard. It's no job at all to make.

THOMAS McLaughlin, Cleveland.

On Lubing Car Windows

"How to Hunt Down an Oil Leak"
[Jan.] makes one suggestion that will
cause more harm than good: using oil in
the window channels. This will soften the
rubber cement and the felt it holds will
be ripped loose. Powdered graphite is a
much better lubricant for this.

Difficulty in raising or lowering a win-

A BETTER JOB

MORE MONEY



LEARN ACCOUNTING...

SEND FOR FREE SAMPLE LESSON

You need no special talents to be a success in Accounting. You do not even need a preliminary knowledge of bookkeeping. All you need is the will to win—the will to work—and if you apply yourself you, too, can get into the bigger-money class.

Demand for Accountants far exceeds the supply—and this demand is increasing every day. A capable accountant should never have any trouble getting a job—and at better than average earnings.

We train you from the ground up—Basic Accounting right through Accounting Systems and Federal Income Tax. Then CPA Training to prepare for the CPA examinations.

Why Be Satisfied with Your Present Job?

Why accept mediocre pay when right in your

own home you can acquire the necessary training to advance rapidly in the profitable, growing field of Accounting.

Take the Short Cut The LaSalie Problem Method

Under the LaSalle Problem Method you can acquire a thorough knowledge of Accounting —you can master its fundamental principles—and become

OVER 4,500 CPAs HAVE BEEN TRAINED BY THE FAMOUS LASALLE

PROBLEM METHOD

expert in the application of those principles. You learn by doing—and without losing any time from your present work.

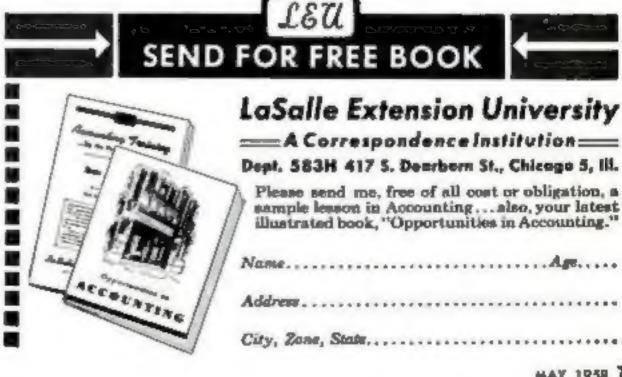
Your training is directly under the supervision of a competent staff of Certified Public Accountants and accounting experts—and you can master Accounting as rapidly as your time and ability permit.

Free Sample Lesson

Send the coupon today—our FREE booklet "Opportunities in Accounting" will be sent promptly along with a sample lesson. It explains fully how we train you from the ground up—or from where you are now—according to your individual needs.

Get all the facts. The cost is low—terms easy. Don't pass this page without tearing out the coupon and mailing it promptly. It can be the means of your success—more money—a better job. Get our FREE booklets and judge for yourself.

ACCREDITED MEMBER, NATIONAL HOME STUDY COUNCIL FIFTY YEARS OF QUALITY TRAINING



California como il

dow may be due to a too-dry balance arm on the regulator crossarms. To remedy this, remove the moldings and aim a few squirts of oil at the moving parts. But don't use too much oil or you'll be cleaning it from the door sill for weeks.

WALTER SCHAEDLER, Newark.

When Is a Mortgage Too Big?

"What Can You Afford to Pay for a House?" [Feb.] should be illuminating to future homeowners. But there is a point you neglect which much concerns me when I interview a customer for a mortgage.

Your formula is fine, but living ex-



penses change. Many newly married couples overlook the facts of life, think of today's expenses and forget that the mortgage will run 15, 20, 25 or even 30 years. During this time they may have several children to feed, clothe and educate.

Bankers get no fun out of saying "no" to a mortgage applicant, yet we feel that if we can show a customer his payments are too great for his pocketbook, we have protected him against foreclosure.

> H. Curtis Ferris, V. P. The Litchfield Savings Society Litchfield, Conn.

Warm Words for Radiant Heat

You are so right when you say that "radiant-ribbon" heating [Hot-Water Heat Without Radiators," Feb.] costs less to install.

Four years ago I installed a hot-water system in my home. I used a large utility room—exposed on three sides—as an experiment. I ran two black pipes, much larger than the ¾" diameter you mention, around the room and added a few air vents and a drainout system. It has been so successful that I would never consider changing this system. The temperature is at least five degrees warmer than the rest of the house.

T. R. PAURICE, Newton, N. J.



Engineer with a tough hair problem. Chemical Engineer Al Judson is troubleshooter at a giant Houston, Tex., plant. Sun, wind, steam mess up his hair.



He licks it with Vitalis. To keep his hair looking neat when he's back at the lab—or out in public—Al always uses Vitalis Hair Tonic with greaseless V-7.

New greaseless way to keep your hair neat all day...and prevent dryness

Whether your hair takes a beating from sun or morning showers, you'll like the way Vitalis keeps it in condition . . .

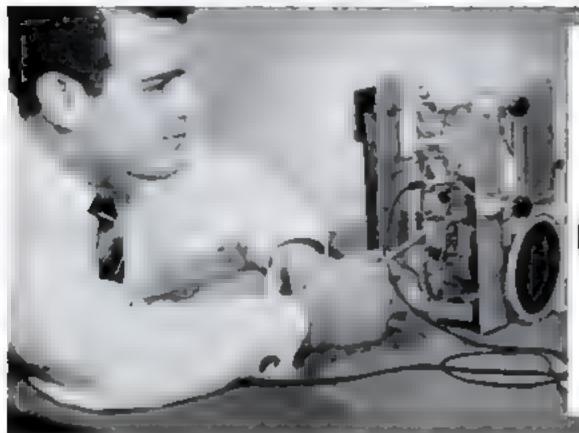
prevents dryness. Your hair never has a greasy look because Vitalis grooms with greaseless V-7. Use Vitalis every day.



New VITALIS® Hair Tonic with V-7®

ANOTHER FINE PRODUCT OF BRISTOL-MYERS

For a Successful Career in Radio-Television



Train at Home in Spare Time with N. R. I. OLDEST and LARGEST

Home Study Radio-Television School

Prosperous Fast Growing Industry Offers You

N.R.I. Trained These Men

Thanks to NRI, I operated a successful Radio repair shop. Now

I am an engineer for WHPE" VAN W WORKMAN, HIGH POINT, NORTH CAROLINA



QUICK SPARE TIME CASH

"Knew nothing about Radio-TV when I enrolled. After 15 ienoons started repairing sets. My future looks bright." DONALD B. ACKERMAN, MINNEAPOLIS, MINNESOTA



"Quit my job to do Television work full time. I love it and do all right financially." WILLIAM P. KLINE, CINCINNATI. ORIO



GOOD PAY-BRIGHT FUTURE-SUCCESS It's the trained man who gets shead—gets the better job, drives a better car, lives in a better NRI 50-50 method, you study basic principles

It's the trained man who gets shead—gets the better job, drives a better car, lives in a better home, is respected for what he knows and can do. For a job with a future—find out how you can train at home for stadio-Television.

TODAY'S OPPORTUNITY FIELD

Training PLUS OPPORTUNITY is the ideal combination for success. And today's OPPORTUNITY field is Radio-Television. Over 125 million home Radios plus 30 million sets in cars, plus 40 million TV sets mean big money for trained Technicians. More than 4,000 Radio and TV broadcasting stations offer interesting and important positions. Color television, portable TV arts, Hi-Fi, assure future growth. Find out about NRI Since 1914—for more than 40 years—NRI has been training ambitious men

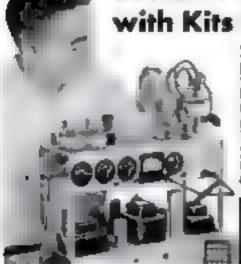
at home in spare time for Radio-TV. With NRI 50-50 method, you study basic principles AND learn by practicing with actual equipment NRI furnishes. You learn with your hands and your head. You get dependable training, backed up by the reputation of the oldest and largest home study Radio-TV school.

ADD TO YOUR INCOME SOON \$10-\$15 A WEEK IN SPARE TIME

Soon after enrolling many start earning extra money fix ng sets. Many open their own full time Radio TV shops after getting NRI Diploma. MAIL COUPON Get FREE Sample Lesson and 6t-page Catalog showing equipment supplied, outlines of courses, opportunities in Radio-TV Price is low-terms easy. Address NATIONAL RADIO INSTITUTE, Dopt. 568, Weshington 16. D. C.

You Learn Servicing-Broadcasting

at Home-By Practicing with Kits N.R.I. Sends



Nothing takes the place of practical experience. That's why NRI training is Learning by Doing. With Servicing Course you build Radio shown at top and other equipment. With Communications Course you build Transmitters at left and other equipment. Catalog shows all equipment you get.

VETERANS Under G.I. Sills



AND CATALOG FREE

National Radio Institute

Dept. SER, Weshington 16, D. C.

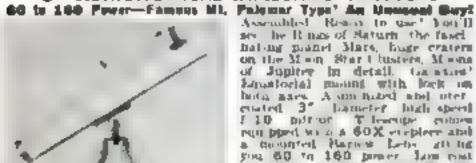
Mail me Sample Lesson and 64-Page Catalog PREE. (No salosman will call. Please write plainly)

Name____Are__

Address

READY FOR THE SPACE ERA! SEE THE SATELLITES ... THE MOON ROCKETS OTHER OPTICAL BARGAINS

See the Stars, Moon, Planets Close Up! 3" ASTRONOMICAL REFLECTING TELESCOPE



see he It may of Maturn, the fascihalling manel Mars, hage craters on the M - n Star I tusters, M - na of Jupiter in detail, the attes? Squatorial mount with lock on hote axes. A sin hard and over coated 3" hamelet high speed I 10 infrom T lescape comes ran pirot in a 4 60% explore and a nounted Parish Leby 40 ha 192 502 50 to 160 proces Low coat. table STUI (If UIT and 272 page Handback of Heaven."

Sinck No. 38,080-M. \$28.60 (a.k. (N. appage Wt. 10 lbm.)

41/4" REPLECTING ASTRONOMICAL TELESCOPE



With this scope you can see energibles as abure but with greater power blue will apilt finer stars. Mirror has twice the light gathering power. Mirror guaranteed to give theoretical I out of resolution. Back and pubsis focus by hardword triprof. from some ring mounting only one as that went follows of a st. Align that take 6 power finder forescope 2 stand and once expirers and mounting that of 120X, and 270X, Low-cost accessory every ten base for power up to 540. Free handbook and Chart. Mapping w tale 25 De. Stock No. 35,005-N 574.50 f.e.b.

MAKE YOUR OWN ASTRONOMICAL TELESCOPE

Bos Cocamber 1887 (same of POPULA); MECHANICS Pages 188-182: 17 at RECH KIT storie in ready to use 4 se districter con-cave a units and the ection is not become for 1° local tensish eye-cises and glum stand first surface distring interes. Price \$16.22 pempeld

Stock No. 50.074-N 4 . Mi rer nice frock No. 50.081-N We have aftil nitel as We have addit often erestoons, tubes, tripeds. In fact everything you need to build to even a

New! 2 in | Combination| Packet-Siso

50 Pewer MICROSCOPE and 10 Pewer TELESCOPE

Useful Telescope and Microscope combined in one amaz ig precision instrument impurted' No inrger than a fountain pen Telescope a 10 Power hi croscope magnifies 50 Times Sharp focus at any tange Handy for aports, looking at small objects,

Send Check or M.O. Satisfection Guaranteed. Order Stock No. 30,089-N \$4.50 Psipil.



Real 150 Power Astronomical Telescope ONLY \$14.95 Pestpold

A good value at this price though this type a plan is not the equat at the Refrecting accepts the not the equat at the Refrecting accepts the file of elements of the rector appets and reason sharp view ing of elementaries of the rector appets of the rector of the same of the same of the rector of the same of the same

Larger 42 and shipetive mass! 07 100 2 m power, same tenjures as alsew, with 38 tube tength—tiprisded free 'Randtwok of the literens', Sing there and (8 page Star Book st).

See The Satullites

New, lew price "Satelliter" Telescope

Get remly for a territo sky show as more Sately little are vanited into space. Nee that i up sign a wind to our at as og has et to Rouge at unities of a wind we will be at a little for it winds at of a wind will be at a little for it winds at a finance 2 power wide 12° field the of high quality was surplux optics makes brock No. 70-150-W

We are the mfr. of the Famous "Moonwatch" Sutallite Felescope!



BUILD A SOLAR ENERGY FURNACE

A fascinating new field. Build your own Solar Furnace for experimentation—many practical data. Easy! Inexpensive! Use scrapwood! We furnish instructions. This sun powered furnace will generate terride heat-2000° to 3000° Puses anamel to metal. Sets paper affame in seconds. Use our Fresnel Lens-14% diseaster fa. 14"

No. 70-130-N Fresnel Lens. 56.00 Polpd. Stock:

STEREO MICROSCOPE



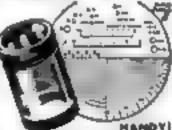
American Made Instrument at Over 50 % flarling. Lp to 3" Working Distance—Erect Image Wide 3 Dimensional Field Used for Inspec-While 3 Dimensional Field Lined for inspec-tions, examinations, counting checking, assem-bitual disserting 2 acts of objectives on rotat-ing target Standard pair of wide field 10X 6 dimer Etopieces give you 23 power and 40 power 11 icm rack and planen forming 10 DAY TI, 1 to Complete an efact in or test manner back Order Stock for 28,080-M, Fall price . \$50.08 for h Barrington, N J, (Nempetgwei assemble 111 to 1 Senatheck or M. D.

Check, Measure, Inspect with this 4 POWER

POCKET COMPARATOR

(Complete with Leather Case) MEASURES D Angles 4 Radii 0 Circles 0 Linear-in both decimal inches and millimeters.

Used to check tayouts, machining on tools, dies, gauges, to check threads chamfers, wear on cutting tools, etc. Stock No. 30,001-N New Loss Price. \$29.50 Petp6



FAST! ACCURATE!



NEW! STATIC ELECTRICITY GENERATOR here a them is spaced that are an job set of a property of the country these to ethics and the property of the country the safe and back on a property to began the country to the country the same to the country the same of the property of the deservation of a backed by the jumpoint space of the country that the country the country to the country to the country of the country of

BE FINGER PELESCOPE

Has crosshairs for exact locating You focus by allding objective mount in and out Bose file any diameter tube-an important advantage Hes 3 centering screws for aligning with main tele-scope 20 mm diam, objective Weighs less than 1/2 pound. Block No. BO,121-N. SB.Db pod.



INFRARED WHIFERICOPE TELESCOPE & PARTS

s o in the cash without being observed War star an receipe M 2 too t cost shout a featest of complete ready to see the fea Power lack the ed by source Will are forto 65 and buttery Battery or trans-

21+ch 440, \$5,053-60

\$3.00.00 f.m.b.

so will more money? Hurld your own Sniperscope? er t turner netro mee part in ading or Parks 1123 t made tubes) phi uple fit- er ere f relation (M. 123 t applied to the control of the cont

DIRECT MEASURING POCKET MICROSCOPE -50 POWER

Fountain pen size, makes direct read ing measurements, for checking amuli parts and dispensions under posseriti magnification of the construction of the const



MOUNTED BARLOW LENS

Double and triple your Telegrope's power with a Racine Lens flues in michael of a chimica plated bears up my with her a've squerers [594] of de ship mounted negative tens into your [14]. It exist note to der into your [14] it exist note to der into your [14]. Stack to thear you 50.00 spd.



CATALOG-N

Yours for the asking

America's No. 1 source of supply for experimenters, hobbyists. Complete line of Astronomical Telescope parts and assembled Telescope. Also huge selection of lenses, prisms, war surplus optical instruments, parts and accessories, Telescopes, microscopes, satellite scopes, binoculars, infrared suiperscopes, etc.



REQUEST CATALOG-N

ORDER BY STOCK NUMBER . . . SEND CHECK OR MONET ORDER . . . SALISFACTION BUARANISHED

BARRINGTON.

The month in science

Underground A-bomb. First reports on a new wrinkle in atomic testing suggest that many scientists and politicians will have to change their thinking drastically. Last fall the AEC set off a small A-bomb (the equivalent of 1,700 tons of TNT) 800 feet beneath a Nevada mesa. The results:

- No radiation escaped into the atmosphere.
- Earthquake-like waves were recorded on seismographs as far off as Alaska, 2,320 miles away.
- ► The blast crushed 450,000 tons of rock.

These facts could be highly significant. Consider what they mean: a) in our high-stakes poker game with the Russians, and b) for the future development of atomic energy.

- ► Tests can be harmless—no fallout to endanger present or future generations. A lot of people all over the world will breathe easier. And for the first time, we have a good counterproposal to the Russian demand that all A-testing stop. (AEC is also testing other schemes to prevent fallout.)
- ▶ International monitoring of tests seems promising. Earth waves would probably give away underground shots, brightening the prospect of effective policing for atomic agreements with the Russians. Doubt on this point, however, still triggers name-calling argument among top scientists.
- Commercial use of atomic bombs (as opposed to nonexplosive atomic furnaces) is feasible. An explosive that can crush 450,000 tons of rock with one shot would come in mighty handy for mining ore, loosening up oil trapped underground, or moving mountains that nature left in inconvenient places.

Even more exotic applications are possible, reported the AEC after it finally managed to drill back into the explosion center:

- ► Steam for power could be generated by piping water into rock heated by the A-blast. The drill holes revealed temperatures as high as 190 degrees near the detonation point—and this was four months after the bomb went off.
- ▶ Drastic heat and radiation treatment could be administered to materials planted around the bomb. The test blast hollowed out a 110-foot-diameter "glass ball" lined with molten rock, but it was quickly crushed by the weight of earth above it.

Does this mean that artificial diamonds, sapphires and rubies might be created from minerals in the ground surrounding the explosion? Some scientists think so. But the AEC's drillers found none this time.

TV without shocks. General Electric is first to Do Something about the possibility of electric shock from vertical-chassis TV receivers (industry action was forecast by PS last fall). New GE portables have one-way plugs: one prong is slightly wider than the other. If your house has matching outlets (very likely, for they've been standard for years), and if the electrician installed your wiring

The month in science

correctly (better check that), then this plug makes sure that the TV chassis is connected to ground. It provides effective, but not absolutely foolproof, shock protection.

GE also covered the metal cabinet with vinyl fabric. Main reason was appearance, but the vinyl does serve as insulation.

Could we shoot down enemy missiles? It's a little like swatting a mosquito in the dark with a paper clip. An ICBM can cover 5,000 miles from launching site to target in about half an hour. Still, the Air Force is betting a billion dollars that it can give 15 minutes' warning, according to Aviation Week.

The sentries will be three very-long-range radar stations making up an Arctic Warning Line. Each station will have two radars. One type, similar to those now used to follow our own (and Russian) test missiles, will monitor the air over Russia. If it detects something, it will aim the second set, Lincoln Laboratory's giant Millstone Hill radar. This type will decide if the intruder is a missile, then compute its path.

Actual shooting-down will be the Army's job, from anti-missile missile bases guarding key targets. Two systems are in the works.

- ▶ Nike-Zeus uses four radars: No. 1 detects the intruder, No. 2 latches onto it, No. 3 tracks it, and No. 4 helps guide the antimissile missile toward it. Parts of the Nike-Zeus are already built and it could be on the firing line in four or five years.
- Plato also uses the Nike-Zeus missile but is mobile, with special launchers and truckborne electronic gear. It could be used overseas, or around U. S. cities to knock down sub-launched missiles.

How effective are such defenses? Present guess: They would miss three times out of four. One problem is decoys.

The Russians could separate the last-stage rocket motor after it had burned out, then blow it up to surround the warhead with a screen of fragments extending over thousands of square miles. To present radars, the harmless motor fragments would be indistinguishable from the lethal warhead.

These decoys, lighter than the warhead, would have less momentum and would be slowed down more by air on the way down to target. So at the very end, the warhead would be streaking ahead, alone and vulnerable.

But if the defenders wait for that, they get about four seconds to launch their anti-missile missiles.

Fingerprints away. It won't help crooks any, but those identifying grooves and ridges on fingertips can be destroyed, after all. Skin planing, with the high-speed electric wire brush used to remove facial scars, does it, according to Dr. James W. Burks Jr. of Tulane University. The skin surface that grows back looks like the web between thumb and forefinger. Fortunately for the cops, lack of fingerprints would look mighty fishy.

Water Mann



IN TOWN TRAFFIC . . . some spark pluga, designed for high speeds, become fauled and cause minfring and loss of power when driven at low speeds.

ON THE HIGHWAY . . . some spark plays, designed for low speeds, makine causing power law and small destructive prefignation when driven at high speeds, 11 by gamble when . . .

Auto-Lite Resistor Spark Plugs with POWER TIP "Fire Up" your engine* at all speeds!

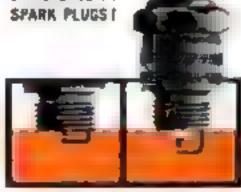


If you drive at both town-traffic and highway speeds, here's why you should use Power Tip ... the first spark plug ignition-engineered for today's engines and today's driving.

At low speeds, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away clean. At higher speeds, the projecting tip is in the path of the incoming air-fuel mixture where it stays cooler to effectively check power-robbing pre-ignition. Ask your garage or service station to install Auto-Lite . . . the only spark plugs with Power Tip . . . and start enjoying top performance and economy from your car at all speeds.

*Power Tip, with or without Resistor, is ignition-engineered for overhead-valve V-S engines and for most overhead-valve 6-cylinder engines in all these cars. Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dudge, Edsel, Ford, Hudson, Imperial, Lancoln, Mercury, Oldsmobile, Nash, Packurd, Ptymouth, Pontiac, Rambler, Studebaker.





Ordinary Tip

Power Tip

Power Tip protrudes farther into the combustion chamber for better ignition. Fuel burns more evenly and completely to give top performance and economy at all speeds.

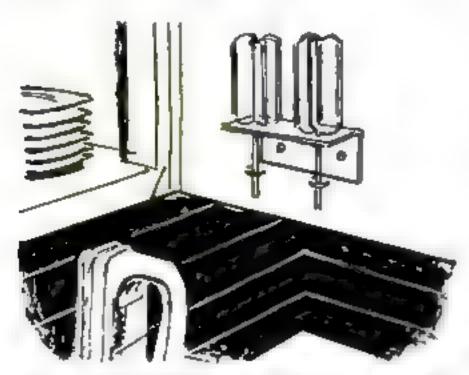
AUTO-LITE POWER TIP

Keeping the Home Shipshape

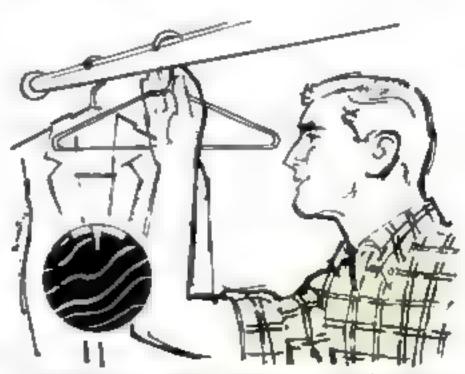


nothered by wasps? The N. J. State Agricultural Experiment Station says they become lazy homebodies at nightfull. While the wasps sleep, spray them with DDT or chlordane.

A READY-MADE GARDEN TREUIS is right at hand if you have a folding gate no longer needed to keep a child within bounds. Turn it on end and nail it to a post or to the house.



store a portable Mixer's BEATERS on a cabinet door. Make a right-angle bend in a piece of aluminum and drill two sets of holes to take the beater shafts and two mounting screws.



HANGERS WILL SLIDE EASIER on a wooden closet pole if you serew a strip of half-inch steel box strapping or other thin metal along the top. Countersink the screws and wax the metal.

A POPULAR SCIENCE

Men 17 to 55-GET FREE FACTS!

See How DeVry Tech Can Prepare You For A Profitable Future In Many Fields

from Communications to Guided Missiles, etc.



Laborers and bookkeepers, store derks, shop men, farmers, salesmen — men of nearly every calling—have taken the DeVry Tech program and today have good jobs or service shops of their own in Electronics. You don't have to guit your present job. If you are 17 to 55, see how you may get yourself ready for a future in the fast-growing Electronics floid.

Whether you prepare at home or in our wellequipped Chicago or Toronto Laboratories, you get sound, basic training in both principles and practice. At home, you use educational mavies. You build actual circuits and test equipment. You read simple directions, follow dear illustrations. When you finish, you are prepared to step inte a good job in this excitingly different field. You may even start a service shop of your awa. Mail caupen for free facts today.

Get FREE Booklet!

We'll give you a free sapy of an interesting booklet, "Electronica and YOU." See for yourself how you may take advantage of the apportunities in this





DeVry Technical Institute

Radar

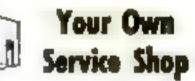






Computers





FREE

EMPLOYMENT

SERVICE

Braft Age?

heat the couper.

Formerly DefOREST'S TRAINING, INC.

"One of Harth America's Parament Electronics Training Contact" Accredited Number of National Home Study Council

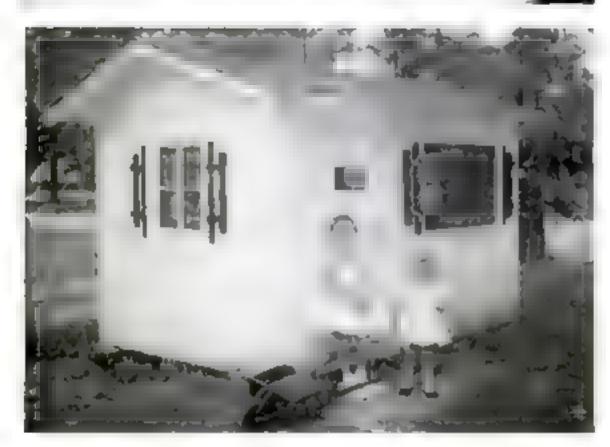


4141 Belmant Ave., Chicogo 41, IR., Dept. PS 5-0
Phones give me year PREE bucklet, "Electronics and YOU," and
tell me how I may propure to nater one or more branches of
Electronics as listed above,
Home Fried
Shoul Ant.
City ZentState
[] Chack here if subject to Military Training.
DeVry Toda's Connelles Training Couter is Income 2040 at 626 Receiver Avenue, Toronto 12, Outurio
2049 et 636 Recolarum Avezare, Toronte 12, Cuturio

Prize Projects BY PS READERS







Boat Draws Six Inches. Piloted through the treacherous waters of Port Phillip, Australia, this 17-foot cabin cruiser often glides over sandbars just six inches beneath the surface—a feat matched by no others of its size in the area. Robert J. Amor of Frankston, Victoria, built it from plans in the February, 1939, issue of POPULAR SCIENCE. curved cabin roof is laminated and resin-bonded. A 12-hp. outboard provides plenty of power for the seaworthy craft.

Transistor Radio, Though it looks like the work of a professional, this transistor radio (PS, July '57) is the first project to be built by Bill Conkie of San Francisco. His friends are amazed at the tone quality and appearance of the set, which is finished with 10 coats of jet-black lacquer rubbed to a high polish and protected with wax.

No-Mortgage House. The four-foot doorway and fivefoot ceiling are just right for these two little girls posing in front of their own playhouse. Their father. George W. Hicks of Bainbridge, Ga., built it for them in his spare time with hand tools and a table saw. Features of the six-by-eight-foot house include a picture window, built-in cabinets, a table and chairs—all scaled down to juvenile proportions—and no mortgage to fret about.

Have you recently completed a workshop project of which you are particularly proud? Send a good photograph of your work, along with the negative and a brief description,

to the Mechanics and Haudiers it Editor Portican Science, 351 Fuurth Are., New York 10, N Y We will pay \$15 for each item that is accepted for publication.

Get "The Most" in Pay and Job Security—

LEARN AIR CONDITIONING

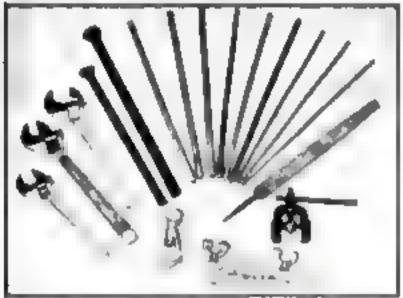
MAKE HOME YOUR TRAINING SHOP

& REFRIGERATION



You Practice with 23 Kits

You learn fast because CTI sends you 23 kits. Illustration shows heavy-duty ¼ h p. refrigeration high-side which you will build-and keep. Only CTI sends these kits.



You Get Professional Tools

Here are tools included in just one kit. You get other tools, tubing, much equipment. Tools develop your interest and skill, speed up training.



You Learn in Easy Stages

Another kit, which includes motor, fan, pulley, service tools. Kits are sent on a planned schedule to help you learn in easy stages. There's no other training like this!

A GOOD JOB, MORE MONEY, BRIGHT FUTURE -all three can be yours in the Air Conditioning & Refrigeration field! Thousands of mechanics are needed to repair and service the 150 million units in use-and the six million air conditioners, freezers and refrigerators that are produced each year, You had an can earn more money in a better job-if you are trained. For information on how to get this trainmg, just fill out and mail coupon below. No obligation!



A New, Easy Way to Learn in Months

CTI training is quick and effective because it is practical. You learn by doing. During the course of your training, you receive 23 big kits, including tools. You practice with these kits, get valuable experience. For instance, you do 10 complete service and trouble-shooting jobs with CTI kits. You assemble a heavyduty, commercial type, % h.p. high side (illustrated at left). You build an air conditioner, refrigerator, freezer or milk cooler -and you keep and use this valuable unit! Only CTI sends you these fine tools and kits-helps you get real on-the-job training! And all this fine equipment is yours at no extra cost! With CTI training you can start out as a mechanic and avoid years of work as a lower-paid apprentice.

Earn Good Income as You Train, too

CTI training is so practical that students often work in spare time repairing air conditioners and refrigerators. They add to their income this way. Some get jobs with local dealers; others work on their own. Many students go in business on graduation. A number get full-time jobs while they're students.

A Wonderful Opportunity to Be the Boss

If you want to own a business, Refrigeration offers you opportunity for success. Since most jobs are service calls, you can build up a list of potential customers. Very little capital is needed to start.



Mail Coupon For Two FREE Books

Mail coupon below for two books which give you complete information. One is entitled Success in Air Conditioning and Reingeration, The other is a Lesson Sample, Both FREE,

DO NOT DELAY-MAIL THIS	TODAY
Mr. E. C. Anderson, President Dept. R-478 COMMERCIAL TRADES INSTITUTE 1400 Greenleef Ave., Chicago 26, Id.	
Mail me SUCCESS BOOK and LESSON SAMPLE. No cest or obligation.	The same of the sa
Para	AM CONDUCTORING
CSty. Zute Stufe	

"I'd like to see them make..."



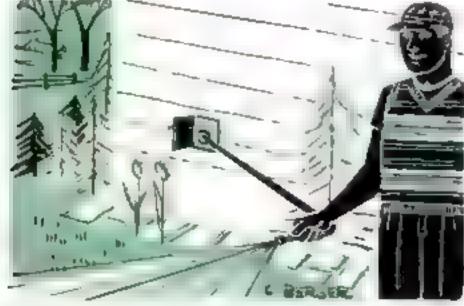
MORE RIGID SHOWER CURTAINS. Narrow ribs of plastic (like collar stays) spaced about two inches apart would keep the curtain from wrapping around you.—Hazel Atkinson, San Diego, Cal.



conventible station wagons. Removable roof sections and rear windows would make them open cars in summer. They'd serve as open-bed trucks, too.—Bob Marie, Huntertown, Ind.



EASY-TO-OPEN PROZEN-FOOD PACKAGES. Pullstrips like those on cigarette packages would make a simple job of getting at the sealed-in contents.—Mrs. Chester Combs, Tucson, Ariz.



GARDEN MOSES ON AUTOMATIC REELS installed inside the basement. They'd pay out or reel in hose like the extension cord on some appliances.

—S. P. Jacobus, Fairfax Station, Va.



REAR-VIEW MIRRORS that can be easily re-aimed after they've been moved. Marked dials would let each driver of the car adjust the mirror to his own setting.—J. Nathan, Winnetka, Ill.

Everyone has his own pet idea of a gadget that he would like to see in general ose. The five ideas illustrated above were suggested by Portstan Scatters readers. What's

yours? We will pay 15 for each one published. Please use Government posteards only. Write name and address elearly, Contributions cannot be acknowledged or returned.

THESE MEN ARE GETTING PRACTICAL TRAINING

ELECTRICITY

-ELECTRONICS

On Real:

A.C. and D.C. MOTORS
GENERATORS
SWITCHBOARDS
CONTROLLEM
WIRING JOBS
APPLIANCES
ELECTRONIC UNITS

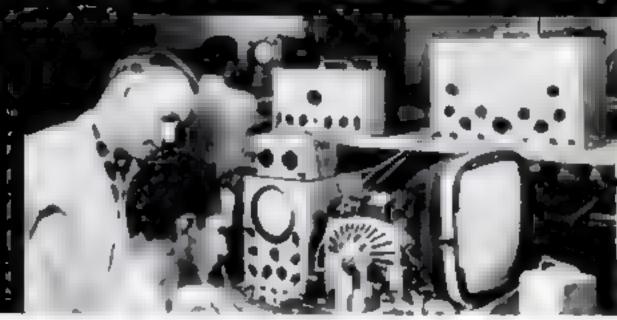
Consider the same of the same

AND TELEVISION FRADIO

On Real:

TELEVISION
RECEIVING SETS
Including Color TV
AM and FM RADIO
RECEIVERS including
AUTO RADIOS
TELEVISION TEST
EQUIPMENT

(Richt Instructor helping students check the wering and trace circuits of felevision receivers.)



Train in the great SHOPS of COYNE

Largest, Oldest, Best Equipped School Of Its Kind In The U.S.

Whether 17 or up to 45 years of age, prepare for your future now Don't be satisfied with a "No Future" job Train the Coyne way for a better job in a held that offers a world of opportunities in the years ahead

FINANCE PLAN Enroll now, pay most of tuition later Part-time employment help for students. WE TRAIN YOU IN CHICAGO on real equipment. Trained instructors show you how, then you do practical john yourself. No previous experience or advanced education needed.

CLIP COUPON NOW for big new illustrated Coyne hook "Guide to Careers in ELECTRIC ITY and TELEVISION-RADIO" No obligation, no seismon will call. Get vital facts now! Training in Refrigeration and Electric Appliances can be Included.



B. W. COOPLE, 37-, Proc. COYNE POUMOED 1800

A TECHNICAL TRADE INSTITUTE OPERATED NOT FOR PROFIT 500 S. PAULINA STREET, GHICAGO, Dapt. 58-40

DACTRICATY - MADE - TOURNION - REPROCESSION - OLICTROSCO

Mail Coupon for Blg Free Book

Triville Offered to YETERANS and NON-YETERANS Allky

B W COOKE, Jr . President COYNE ELECTRICAL SCHOOL

500 S. Paulina St., Chicago 12, III. Dept 58-4C. Send FREE book and details of all the training you offer. This does not obligate me and no salesman will call. I am especially interested in

□ ELECTRICITY-ELECTRONICS

B TELEVISION-RADIO

NAME
ADDRESS
CITY STATE

All New SUPER GRAPHIC*45



One of the outstanding features of the new Super Graphic is the exclusive, advanced triple-purpose rangefinder which is built into this camera as standard equipment. By means of large, easy-to-handle interchangeable cams, this new rangefinder can be coupled and exactly matched to the focal length of wide angle, normal or telephoto lenses in seconds. This advanced new triple-purpose rangefinder makes possible (1) precision optical focusing for critical work; (2) accurate dial-type focusing for fast camera operation; and (3) automatic indication of f-numbers for correct flash exposures. The new dial-type focusing scale and flash exposure computer are located on the top of the camera for the utmost convenience and operating ease. The price of the camera, with 135mm Graflex Optar f/4.7 lens in fully synchronized shutter is only \$375.00.

To learn about the other advanced features of the Super Graphic, write Dept. PS-58,

Graflex, Inc., Rochester 3, N.Y.

GRAFIEN Price-Winning Comerce and Equipment

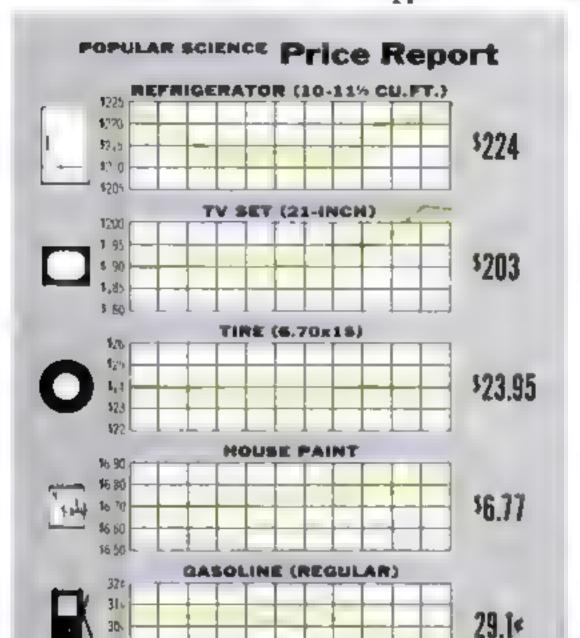
*Trade Mark. Prices include federal fax where applicable and are subject to change without notice.

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

You ought to know...

Prices are weakening. Nothing to rave about. But almost everywhere—New York, Philadelphia, Detroit, Chicago, Los Angeles product prices in the Popular Science Price Report have slipped or leveled out. Some late developments:

Paint and tires have dipped a few cents, refrigerators are up



Respect fourteen Systems Proportion Some sits others 1 & Bureau of Labor States and

a bit. And television prices—long in a steady climb—have finally lost some of their sting.

Regular and premium gasolines show one-cent price hikes in the industry's quotations, but if you live in some areas of New England, the Midwest or the Northwest, you may not yet have felt the effect. Local filling-station wars have provided bargains for motorists.

For regular-gas users in other parts of the country, all is not gloom: Record stocks on hand may keep gas prices from soaring much higher. But there seems to be little hope for owners of late-model, high-compression cars. Premium-gas costs

are heading toward even higher levels—especially on the West Coast. Reason, according to refiners: The octane race keeps boosting production costs.

- ► This month, only one thing kept the Price Report from dropping all across the board: Prices for television sets in New York spurted—an increase of \$4. That firmed the average TV price, because TV sales tags in other cities went down.
- By paring prices, manufacturers of some products hope to whet your appetite for buying. But don't play it cool. Don't hold off, hunching that another price cut is on the way. Retailers' price tags now don't leave very much room for profit. For any bargains in the future, the manufacturers will have to come up with costcutting gimmicks in production and distribution.

Dye your sun-baked grass? Green dyes, developed by the chemical industry, have been tested by Dr. Victor B. Youngner, turf and

You ought to know...

grass specialist at UCLA. His verdict: A good-quality dye won't hurt your grass, can last two to eight weeks. But you must still give the lawn an occasional watering. The dyes are available from garden suppliers.

- Who is the boating hot-rodder in your family? This summer, don't point accusingly at Junior. You, the head of the family, are more likely to captain an outboard recklessly. The Outboard Boating Club of America, Chicago, rounded up statistics to prove it. Dad has all the earmarks of being accident-prone when he's afloat. Almost 70 percent of all boating fatalities are among men on fishing trips—their average age, 35. And their boats are usually either small-sized or large. Medium-sized boats—14-footers—have the best safety record.
 - ➤ The quiet, pipe-smoking rod wielders are sometimes devil-maycares at heart. They overload their boats. They stand up and move around. And they head into dangerously rough weather. All this runs up their high mortality rate. (Boat-going hunters, more cautious, have only a seven-percent accident rate.)
 - ► The youngsters appear to have more sense than their elders. Sure, they're attracted to what might be called hot-rod boating; racing and water skiing. Both sports look dangerous. But they aren't. The accidents involving young people under 20 account for less than 10 percent of all mishaps. Possible reasons: better training and respect for boating regulations.

Actually, the waterways are a safe place to spend your leisure. The ratio of fatalities to outboards in use improves every year. In 1949, there was one death for every 2,100 outboards. Today, your chances of getting back to port are more than twice as good. Present estimate: one death for about 4,400 outboards.

Dialing long-distance calls nationwide? It's a dream halfway to reality. That's the latest progress report from American Telephone & Telegraph Co., parent of the Bell Telephone system.

Bell has been soldering in more transistors and relays so that, eventually, you'll be able to dial direct to any of 62,000,000 fellow phone subscribers. The project, begun in 1950, calls for 300 big switching centers spotted around the country. A switching center picks your call from an incoming long-distance line and feeds it to the right outgoing line. It gets around having an operator link the two lines by hand.

Half the centers are already clicking away, routing calls. Within 10 years—maybe five—the rest will be in business.

Telephone engineers are leaving room for future foreign business, too. They plan tie-ins with three phone systems outside the U. S.: Europe via the new transatlantic phone cable; Hawaii over the Pacific cable; and Canada, which has 5,000,000 phones in service now.

Title registered; contents copyrighted

Carees m. Graney

"There's more than one way to improve your gas mileage"

checks and adjustments."

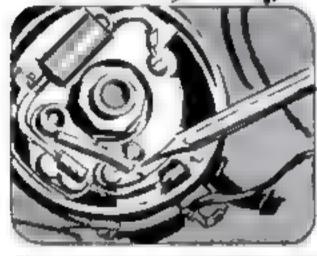
Maure Rose - experimental test driver and

"A professional driver has a lot to do with geiting top performonce and economy from new cors he tests. But, the best cosuits also depend on a number of Intricate systems under the hood. That's why he relies on trained mechanics for needed

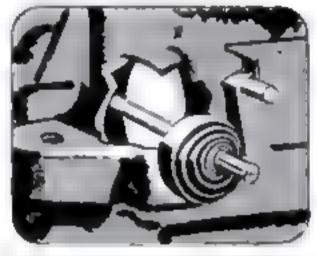
automotive engineer.



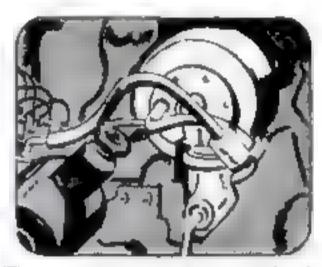
"Worn sports plugs could be a source of power and feet lass. Electrades must be clean, properly gapped and free from correcton. New plugs at least every 10,000 wiles is best."



"A pro always makes sure distributor points ore clean and set of the proper distance for best performance. Arcing or cracks in the cap may develop to further decrease gas mileson.



"A trained mechanic checks the manifold heat control valve for possible trouble. A volve that's stock open delays proper experization, a closed valve creates a tess of power."



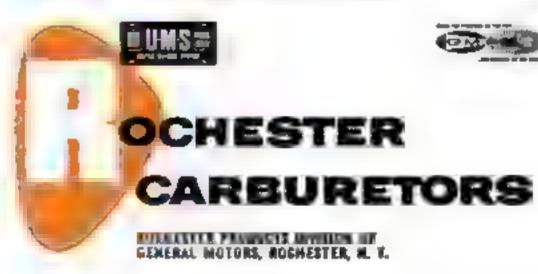
The vocuum system must be examined and connections tightened. Air filters should be cleaned. Clagged Afters or air leaks upset talxture ratio and cause rough idle and fuel tose."



"Your carburetor should also receive a thorough thack for any signs of needed adjustment, repair or cleaning. Proper care assures precision operation and maximum fuel economy,"

> Specified as original equipment on more note cars than any other curburator.

Make sure you're taking advantage of the many ways to improve your gas mileage. See your Rochester Carburetor Specialist. He can properly diagnose your engine and make the necessary adjustments to give you the best possible performance and economy. And he's factory-trained to keep your precision-built Rochester Carburetor in top condition to deliver maximum mileage.





COLDEN BATE BR DEE MAN PRANCISCO

Big news on the road today is Quaker State. It's preferred by more and more people the world over who really care about their cars. This superb 100% pure Pennsylvania motor oil keeps engines cleaner, gives smoother performanceand lasts longer! Wherever you drive, the best motor oil money can buy!

QUAKER STATE OIL REFINING CORPORATION, BIL CITY, PA. Member Pennsylvania Grade Crude Oil Association

GRAVELY makes ough Jobs

Powerful 5-HP Gravely, America's most versatile small tractor, does every lawn, garden and field job faster, easter, better!

Choice of 30 performance-proved tools. All - Gege Drive, Power Reverse, Push -Button Starter optional.

New 24-page ' Power or Drudgery" Booklet shows how Gravely power and performance can solve YOUR problems. Write for it today " GRAVELY THACTORS.INC.

DUNBAR, W. VA.

D-TESTED SINCE 1922

Worry of FALSE TEETH Slipping or Irritating?

Don't be embarrassed by loose false teeth slipping, dropping or wobbling when you eat, talk or laugh. Just sprinkle a little FASTEETH on your plates. This pleasant powder gives a remarkable sense of added comfort and security by holding plates more firmly. No gummy, goney, pasty taste or feeling, It's alkaline (non-acid). Get FASTEETH at drug countern everywhere

ENGINEERING

DEGREE IN 27 MONTHS

B.S. DEGREE IN

AEBONAUTICAL, CHEMICAL, CIVIL, ELECTRICAL, MECHAN-ICAL and ELECTRONIC ENGINEERING (lot, Epgip and TV)

Also U.S. DEGREE in 36 mo. in Mathematics Chemistry, Physics tincluding Nuclear Physics Engineering 8 ches preparators courses. Thorsugh practical program, individualized instruction emphasized, top eniment approved for G 1 s.

Keeping pace with progress in science and engineering

Spacious campus 20 buildings detmituries gymnasiam Playing Seed. Modern we'l equippes aboratories including new physics into and wind turbel. Low tartion. New terms start quarter v. Enter June, September, December, March, But demand for graduates. Students from 45 states and 40 toroign countries. Many carn a major part of their college expenses in this large industrial center. Send coupon for free catalog and full information. Enroll now

1		(DIANA	TE	CHNIC	AL	COLI	LE	GE
5	8 E	Washingt	on Sc	wleverd.	Fort	Wayne	2.	India

П	THE TENTH OF THE
	658 E. Washington Boulevard, Fort Wayne 2, Indiana Pieose send me tree information on 27 Ma, 8.5, DEGREES In: Aeronovical Chemical Civil Electrical Civil Electronics Mechanical Electronics Degrees in:
	Malbematics [] Chemistry [] Physics []
ł	No-to-
	Address

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

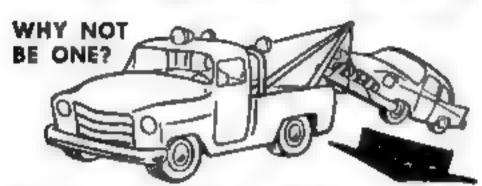
A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

82-E DISTRICT NATIONAL BUILDING WASHINGTON 5, D. C.

America Is Short 100,000 **Auto Mechanics!**



It's easy to train at home for a TOP-PAY JOB with a BIG FUTURE!

Stop worrying because you need a better Job-or because you need more pay! Over 100,000 jobs are waiting right now for newly-trained auto mechanics, Here's why: There are 60 million cars and trucks on the roadand one-third need heavy repairs. Over 7 million new vehicles are made annually-also need service. No wonder the demand is bid for auto mechanics-why pay is tope, work is steady!

YOU CAN LEARN AUTO MECHANICS in months, at home in spare time. Let CTI train you with its femous Shop Method. It's easy. It's fast. Mail coupon for free details.

You Practice with Tune-Up Kit and Tools





CTI training is practical. You get a valuable Tune-Up Kit, the kind that experienced mechanics use to locate engine troubles. You receive a Compression Tester, Vacuum Gauge & Fuel Pump Tester; Ignition Timing Light; portable steel case. You also get a set of professional mechanic's tools, including socket set with extension. You'll use instruments and tools to practice, to make repairs, to earn money as you train. (Note: Diesel Mechanics or Body-Fender Repair instruction too-st no extra cost.)

Many Students Make Money as They Train

Boos after they begin training, many students fix cars for others. They not only acquire useful expensence—they also cars money. Their earnings help pay turtion, buy shop equipment, start many in business. Mail coupon for details.

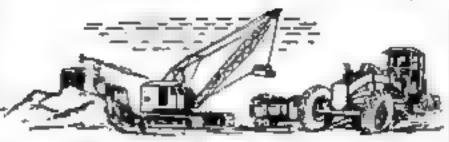
COMMERCIAL TRADES INSTITUT

1400 GREENLEAF AVENUE CHICAGO 24, ILLINOIS

Sand booklet, Big Money is Auto Mechanics. and Sample Lesson. BOTH FREE.

Zene___State.





WAGES!

Make hig pay in the construction industry as an operator of Balldazers, Droglines, Shevels, Back Hoes, Scrapers and Motor Graders. Learn these skills NOW! Machines of major monufacturers are used in our training program, Contractors need operators of earthmoving machines and pay high wages to our graduates. Don't be satisfied with just a job . . . learn a career!

> VETERANS: Ask about G.1 Benefits. Write TODAY for FREE School Catalog. no obligation, to either address

National School of Heavy Equipment Operation

O. Sex \$243, Dept. A-7. Charlette, N. C.

Western Nutional School of Heavy Equipment Operation

P. O. Box 527, Dopt. A-9 Weiser, Idehe

MAKE STRIPES with

Straight, carved, single or double With any rolur paint, stripe furnitute, bikes autos, model planes, toys limbeum, wad board. Clean, erisp decorative itnes Can't cloy or ament. A so use with glur tempera, textile paint or underglass—on wood glass. plastic ceramics metals. l'abrics and pager Ask your dealer or order direct

DEALERS HOBBY of riping tool results every in display time Simple, carried, Write casy to oss for decounts Order now

Ash about beary duty etriping tools

SCOMBINATIONS. .



1 16" tripe

Other single \$175 stripe models 114 1/84', 1/32', 3.84', 0/64', 3.33' & 1/6'

Complete Kit 55 08 (all 7 tips)

Extra tipa 80e es.

4234 LINCOLN AVE., Dept. 242 CHICAGO 18. ILLINOIS

Earn \$6,750.00 your First Year Start part time if you wish, We locally train you, furnish everything to clean and mothercost rugs, uphointery of lecotion by world-wide process. Quickly ratablished. Nushup needed Just Z everage jobs a day bring M. 50 netprofit in year Employ others and mult my profits. You get Natural Advertising Parents See. 25 other regular services Easy terms. Send today for free booklets. DURACLEAN CO., 6-165 Duraclean Sidg., Deerfield, M.



Get this big valuable collection of genuine, all-different postade stumps from the execting fund of the mysterious scarce airmails, forfeous commemoratives, grant-sized stamps picturing wild horses, covered wagone action packed fights, buttve war heroes: PLUS senastional train stamp, beautiful "Christ of the Andes" many others. EXTRA! Bergeis Catalog. "Collectors" Manual" plus other exerting offers for your inspection. Enclose 10¢ for mailing expenses . . . ACT NOW! JAMESTOWN STAMPS, NSBPS JAMESTOWN, N.Y.

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are your laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

McMORROW, BERMAN & DAVIDSON

Registered Patent Attorneys

PATENTS - COPYRIGHTS - PATENTS
142-M VICTOR BUILDING, WASHINGTON 1, D.C.

HOW TO FIX ANY PART OF AH

QUICKLY -- EASILY -- RIGHT!



Wor an expert mechanic now you can breeze through" any fix-it job from simple carburetor adjustment to complete overhaul. Just look up job in index of MOTOR & Brand New Auto Repair Manual Pollow simple step-by-step directions, clear pictures Presto-the job is done

No guesswork' MOTOR'S MANUAL takes you from 'acratch - shows WHERE to start, WHAT tools to use Covers EVERY job on EVERY cal listed - from 1949 (Arm 1954)

Everything You Need to Know "Bolled Down" from 176 Official Shop Menuels

NEO NEW, REVIEED, ENLARGED. Edition to the late the treet for in 176 in

Try Book FREE 7 Days

Just mail compan (Atrach is to posteard
if you wish Make
Manual prive what I a University to agree the is he greatest lime and wish according and wish according to the furthern tiday is North limit 15 25 250 West 5 th New York 18 New York

New York

Inna FREE Offer On MOTOR's New Truck Repair Monual

Mar Freit.

Caditian

Chryvetet

Chrynige

C) pper

Do Boto

Hard som.

imperial

Podge

Edeal

Ford

Covers EVERY Job on 1.V5.HV popular make How se and I went truck made oney 1040 FILE 7 Day Trial Lheck propse but in output.



Covers ALL Medels

- 1949 thru 1958

Continental Packard

Jees

Negh

Linearin

difference of the

Øldsmeblie

Plymouth

Pertine.

BARRIOT

Militare

Studebaker

The audorbied

MAIL COUPON NOW FOR 7-DAY FREE TRIAL

ľ	(Attach to Postcard if More Convenient)
i	MOTOR BOOK DEFT. Deak 28, 250 W. 55th St., New York 19, M. Y. Rush by me at ance (check box especits book yes trans):
i	MOTOR's New AUTO REPAIR MANUAL IT O K., I will result fit in 7 days 12 monthly for 2 months and a Small payment of \$1.00 (plus 500 delivery charges) are months of irr that Others is 1 will return the back postunid in T days. Proveign price, result \$10 cash with order 1
	motor's New TRUCK REPAIR MANUAL. If it K. I with result to to 7 days, and \$2 monthly for 8 menths, plus 35c, delivery charges with final parameter (Stheraster I will relays back postpaid in 3 days, (Foreign price remait \$11 cach with water)
İ	Print Name Age
	Address
!	City Check box and save 35c delivery charge by enclosing Wiffi coupon a cost spe entire payment of \$7.95 f & Auto Manual or \$9 for Truck Manual) Sains return-refund privilege



college graduates get ahead faster!

You see it in your own city They have higher incomes advance more rapidly. Grasp your chance for a better life. automation technical advances create industrial growth caleer opportunities for engineers accountants management esperts. Same rewards awaiting course men. Important firms visit campus regularly to employ Tri-S ate College graduates Start Not contrier in this would samed college. Approved for colerant

Bachelor of Science degree in 27 months

In Mechanicas 1 wh Experience 1 with a territory on 16nd o Tyhas a new E needing In an analysis 5 a consular transto energy Has a territory of Marine Trans-parel Landaceines temtoms: So we are under a new accelera. It wheels course to Draft
has fat a te anogram tech beautiful a stress of respect to the
time fat a te anogram tech beautiful a stress of respect to the
time fat a te anogram tech beautiful as a fat respectively on the
time on Emissioner Has food Proposalory requires
Breathest respect We beginned beautiful and a more stress times than the fat and the stress times and modern tech habitulings and
a more stress times the sent budget roc is a general technique of the sent technique and the sent technique of the sent technique
and the time factor in Lagineering and Commerce.

558 College Avenue * * * Angulu, Indiana

Tan SKINS, Make Up FURS

Be a Taxidermist. Double your hunting for. We track you at Norms. House Bards, Animals, Pots, Boats and Pick Mark of the land of Engineer devotate home and dec MARE MONEY. M out and known in for others. He sparetime profits investigate TODAY.

FREE BOOK with 100 game pictures, in pages. If the post of the big by the pages from the post of the pages from the post of the pages and the HORTHWESTERN SCHOOL OF TAXIDERMY, Dept. 2805, Omeha, Nebr.



PAYS AND SEND FOR PREE, BIG, ILLUSTHATED CATALOG MOW! Graduum report
making sut same a lace sea Start and on your
own buttoess quickly Mrn women of all ages
learn cas by Course covers Sales, Properly
Management Approximate Losas Merigages and
related subjects STUDY AT HOME or it classpooms in reading these fly oma awarded,
Write TODAT for free book! No obligs on,
Approved for World Wat II and Korean Veterans

WEAVER SCHOOL OF REAL ESTATE Est 1976) 20205 Grand Ave.



AMERICAN SCHOOL, Dont. HS48



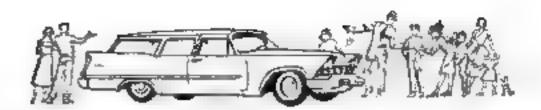
FOOR TELLS

MANY FINISH IN 2 YEARS

No classes. No time wasted going to and from school. Progress as fast as your time and abilities permit. Standard H. S. texts supplied. Thousands enroll each year in this 61-year-old school. Send for FREE descriptive booklet.

Pressel at S8th Without obligati	*		GE descriptive	booklet.
Hame				
Address	d Member	Mational No	ome Study Co	

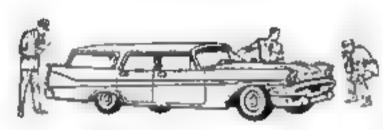
More room to sit...



More room to carry...



More looks to go with it!





The wagons with the FORWARD Look from Chrysler Corporation give you more of what you buy a wagon for

We think station wagons should be family size. Don't you? And ours are. The wagons with the Forward Look for '58 are roomer than any other station wagons on the road. (See the chart.) But that's not all. Chrysler Corporation station wagons pack a carload of family-minded features that no other wagons have to offer;

Handy creak-down reer window and tailgate that goes down flat-with no cables and no awkward window panel jutting out above.

Rear seat felds flush into the floor. You don't have to houst it out to carry things.

Torsion-Aire Ride-smoothest ride on the road today. And at no extra cost!

Pushbutton Torque Flite—simple mechanical pushbutton driving proved in over twelve billion miles of customer driving.

Constant-Control Power Steering that works all the time—not just on curves. Makes parking your wagon a cinch!

Total-Contact Brokes for 25% easier, quicker, safer stopping.

You get more good things in these great new wagons than we have space to tell. So why not simply drive one at the dealer's.

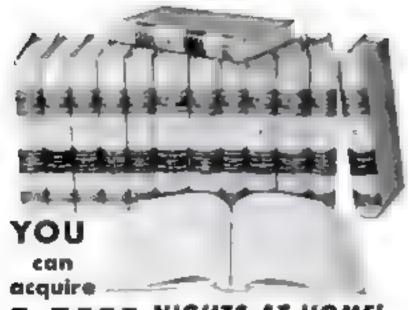
Ph: Bring the whole family. That's who we build our wagons for!

COMPARE of 14 top makes of station wagons	SITTING ROOM (Combined front and rear seat in inches)	ROOM (Cubic feet)
Plymouth	125.0	95.0
Dedge	125.0	95.0
De Sete	125.0	95.Q
Chrysler	125.0	95.0
Wagon A	1199	80.0
Wagos 8	124.8	64.0
Wagon C	124 8	0.68
Wagon D	124.9	87.0
Wagon E	120.5	01.0
Wegen F	120.6	81.0
Wagon G	121.5	64.0
Wagon H	124.6	88.0
Wagon 1	1199	90.0
Wagon J	116.4	65.0

CHRYSLER CORPORATION >> THE FORWARD LOOK



PLYMOUTH >> DODGE >> DE SOTO >> CHRYSLER >> IMPERIAL



NIGHTS AT HOME! LL.B. DEGREE

LaSalle's famous Law Library—used as reference in many Law libraries and Law officeshas enabled thousands to master Law surprisingly fast, in spare hours at home, for business and professional advancement.

These 14 remarkable volumes, compiled by leading professors and lawyers, cover the whole basic field of Law in condensed, orderly, sim-

plified manner.

You advance rapidly with this great library, plus special lectures furnished. We guide you step-by-step with personalized Problem Method of instruction . . . you learn by doing-handling legal problems—not by memorizing rules.

Send for two FREE booklets, "Law Training for Leadership," and "Evidence," answering questions about Law and its value to you, and telling how LaSalle Law graduates are winning rapid advancement in business and public life. Mail coupon below. No obligation.

LA SALLE EXTENSION UNIVERSITY

A Correspondence Institution 417 S. Dearborn St. Dopt. 5831.

Send me your two FREE booklets described above.

without obligation, Name

Street

City, Zone & State





NOWHERE CAN BUCH (NOWHERE CAN BUCH QUALITY BE FOUND AT SUCH LOW PROCES

YOU CAN'T

LOSEI

Super Quality — Rugged Performance — # Manths (abured Service 600ml6 53 651 670ml5 53 85 700ml6 54 45 760ml6 54 75 650ml5 3.85 670ml6 4.05 710ml6 4.35 820ml6 4.35 820ml6 4.35 650ml6 4.35 700ml6 4.35 750ml6 4.35 820ml7 4.85

Suprame Quality—Nothing Finor—12 Months insured Service 600x16 \$5 25 475x10 \$8 48,700x15 4 \$10 45,700x20 642,80 600x16(6) 8 75,640x15 4.05750x16(6) 12 85,750x20 k) 18 80 650x16 8 75,670x18 3.35,700x17 11 95,750x20 2) 17 50 650x16(6) 7 25710x15 3.45,750x17 16.48 628,20 2) 50 700x16 6 35,760x18 3 05,730x18 10 05,500x20 10.58 750x16(6) 8 45,600x15 6.35,700x5 11 25,1000x20 20 45 \$8.48,700x15 4 \$10 45 700x20 6
4.48,750x16 11 12 83 750x20 k)
5.35,750x16 11 12 83 750x20 k)
5.35,750x17 16.48 628,20
9.5,750x17 16.48 628,20
9.5,750x18 10 95 900x20
6.35,00x5 11 25 1000x20
8.35,650x20 11.75 1000x22
9.5,650x20 11.75 1000x22 19.98 20 49 21 25 21 98 \$ 25 870x18 0 15 12x6 kg Whitemalls \$1.00 extra.

TIRE SALES

Speedy shipments on Mail Orders F O B. Chiduct 10% on orders for 2 or more used liver. Send CHECK or MONEY ORDER -- No COD's. 3701 S. Normel, Bapt 55-67, Chicogo 7, 111.

Make big profits on thousands of exotic imports. No experience or investment in products needed Famone world trader shows you how to nocket profits before ordering, how to get products for full or spare time home mail-order business or take volume orders from stores. Export opportunities also. FREE details and booklet mailed to ambitious men and women who want to start a big profit business. Air mail reaches us over night. Write today. MELLINGER CO., Dept. P245 1717 Westwood, Los Angeles 24, Calif.

Famous SPELDWRITING aborthand, 120 words per minute. No symbols no machines, uses ABC's, Ensiest to learn, write and transcribe. Low cost, 150 000 graduates, for hunmass and Civil Barrice. Typing available, 25th Year Schools in over 400 Write for FREE booklet to

D pt 2605 # 42 51 N T 36 N T



Eleset mechanics on co. shory Y v learn epin Misny

Earn \$100 Per Week and up MI AUTO DIESEL MECHANICS

\$ 47 per week and u I a une us experience ne errory. Day and night courses. App oved see and Your or Fee Institute

NASHVILLE AUTO-DIESEL COLLEGE

324 7th Ave., M., Dept. 41

Nashvilla 2, Tonn.



WITE DORMIPHONE

It Works for You . . .

Awake and Asleep

The state of all aces one pas on Write I of

FREE Book NOO MODERNOPHONE. INC. 262-058 Radio City. New York 20, N. Y. Gentlement Please send me your FREE Book. No obligation,

ADDRESS.

Mr main interest a Bormiphonies is fort

Speech Improvement

Language Learning

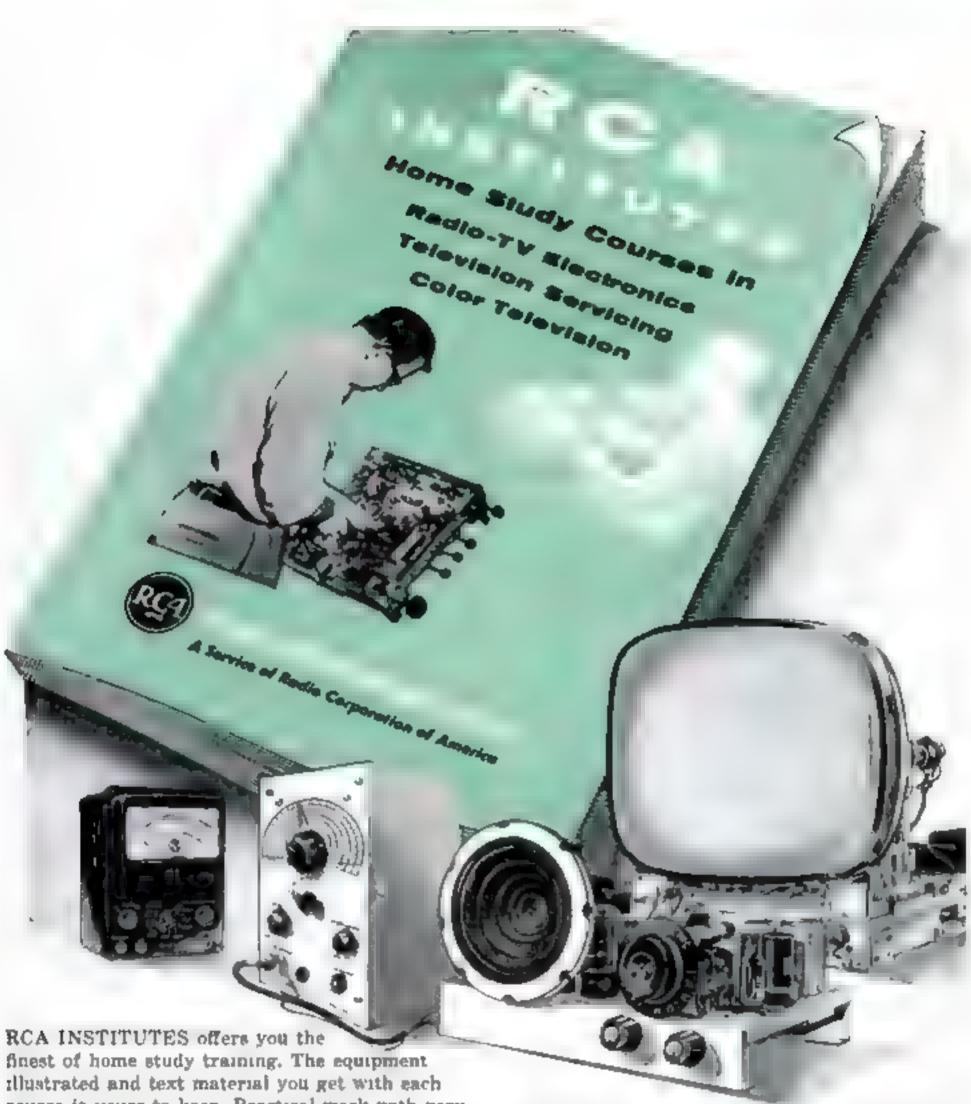
Memorization

Habit Forrection

Carry

Speech Improvement

School or College Work



finest of home study training. The equipment illustrated and text material you get with each course is yours to keep. Practical work with very first lesson. Courses for the beginner and the advanced student. Pay-as-you-learn. You need pay for only one study group at a time.

Send for this FREE Book Now

RESIDENT SCHOOL courses in New York City offer comprehensive training in Television and Electronics. Day and evening classes start four times each year. Detailed information on request.

RCA INSTITUTES, Inc. Home Study Dept. PS-58 350 West Fourth Street, New York 14, N. Y

Without ubligation, send me PRIE 51 page CATALOG on Horse Study Courses in Endin, Talevisian and Color IV No selesman will call.

Name: a place print	44 414+4600-448666
Alleman and a commence of the	** 114275111144144
City	Sture
Rorean Vets! Enter discharge date In Canada — RCA Victor C 5001 Cate de Llesse Rú., Mentreal	

To part time, party teapers on puriously

TATE recommend that you take the following preliminary steps toward patent protection. Make a disclosure of your invention; sign, date and have your disclosure witnessed by two people who understand your invention: authorize us to conduct a preliminary search among previously granted U. S. patents for similar types of invention. We give you a report on the probable patentability of your invention and our recommendation for further course of action.

Let us send you a copy of our instructive booklet, "Patent Protection for Inventors" and our convenient "Evidence of Invention" disclosure form. No obligation.

O. Martin M. Evan

440-E MERLIN BUILDING, WASHINGTON 6, D. C.



every phase of building, estimating, contracting. For-Use spare hours no interference with pres-

AMERICAN TECHNICAL SOCIETY
Dept. PS-550 #80 E. Seth Street, Chicago 37, [15, Please send me your PREF Brochure and full details of your in liding, estimating and contracting trainlag program,

ent work, Diploma awarded Low tuition rates.

Name.

Address

CIG.



RECORD" FORM AND "PATENT INFORMATION

WHOLWONTH HLDG., 44th FLGOR, 14C NEW YORK CITY

NVENTO

Whether an invention is patentable can be substantially determined by a search of the U.S. Patent records. Without obligation, write for information explaining the steps you should take to secure a patent,

JOHN N. RANDOLPH

Registered Patent Attorney

805-Victor Building

Washington 1, D. C.

N.V.E.N.T.O:

TENT INFORMATION VENTOR'S RECORD

without obligation

GUSTAVE MILLER AM-PA WARRED BUILDIN

WASHINGTON 4. D.C.

REGISTERED PATENT ATTORNEY ASSOCIATE EXAMINED

8. 8. HAVE BEFT, 1839-1847

PATENT LAWYER

U.B. PAT. OFF. 1022-1026

S. Patents protect your inventions. Our free

book of "Instructions on Palent Procedure for Inventors," also "Certificate of Invention" form sent without obligation.

C. A. SNOW & CO.

REGISTERED PATENT ATTORNEYS WASHINGTON I. D. C. 476 SHOW BUILDING

RE-POWER NOW with a V-E might Use MERCURY CHEVROLET FORD

in 2 or 4 Whiter Jeeps, Juspiters, Bis Wgn, Trucks, M.J. and Malter cars Converten Kits 143 25 to 550 25. If you want fast action full us which engine you with to use, give us year. Model, 12 or 4 Whiter; of your vehicle. Send Min. \$15.00 Dep. and we will ship correct hit Sal., COD, Send full amt. for Prepaid Pripment. Wire, phase or Write for free details, (Also hits for Ford E engine.)

HOOSIER MACHINE PRODUCTS CO. 1 St. Phone CRU-1442 Purdictor, Grapon

37 POPULAR SCIENCE

—SAVE GAS, TIRES

Warn Hubs give your 4 wheel drive double duty value, with economical fees wheeling 2 w. d. and normal 4 w. d .- automatically,

with Warn Lock O Matter, or

manually with Warn Locking Hubs, Either model will save you money. See your dealer today! WARN MFG. CO., IBC.

Rieprtun Ban 4064-85, Senttle 88, Wn.

MASONITE

Makes the News



Economical wood-grain panels give old walls a new interest

Take the colorful feature wall above. It has the look, the feel of weathered wood...the random effect you associate with custom paneling.

Actually, it's a new hardboard from Masonite — Seadrift*. You nail it up in four-foot stretches (this particular wall took less than two hours). No tedious matching and fitting...no filling and sanding—just put it up and paint it. Seadrift takes any color beautifully—or you can use the textured surface to create a handsome two-tone.

Bear in mind that with Masonite^a panels you have the richness of wood without the work. No cracks, no splitting, no snags—ever! A wonderful buy from the start, Masonite panels are even better in terms of care-free service through the years.



Above is Masonite Misty Walnut. A rich wood grain set off by vertical accents, it's completely finished, all ready to turn your old walls to new.



				of re-
modeling ideas with enclose 10c to cover				nela. I
	r Darbui	ing and mi	amug	
Name				
14 dute.				* *
Address				

Just Pick the Kind of Body YOU Want

CHECK THE COUPON BELOW

... Prove to Yourself - EASILY You Can Have It ... Almost Overnight!

below, the kind of body you want and I'll give it to you SO FAST your friends will be amazed "Dynamic Tension," in easy 15-minnoike your chest and spoulders burge . your arms and

I ge surge with power . your whole body feel abye'

PREE 32-page Illustrated Book 31 pages on any Dynamic Tranton' Clubped me from a 97 lb, weaking 1 to "Warld a Most Perfectly Developed Man —and what it has done for others. Mul coupon NOW Charles Atlus, Dept. 15, 115 East 23rd St., New York City 10. N. Y.



CHARLES ATLAS, Dopt. 16 115 Enst 23rd St., New York 10, N. Y.

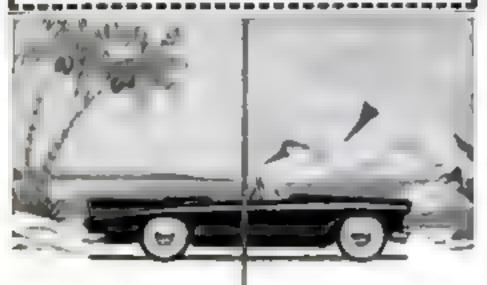
Bear thairles Atlas Here's the hand of Boay I Want et leek as many as you like)

Blommar Walst, Nios Mara Powerful Arms.
Broader Chast Sheylders Mera Powerful Legs
Mara Walght Bolid Better Energy, Sless

More Pewerful Arms, Grip

Being title, a safely FREE, a capy of your famous bank thouse the bank "Jewisseste Transcent" can make the a new man 32 taken the noted to administration afterers to rital questions.

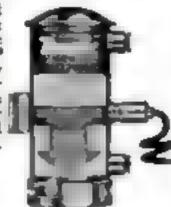
Deam print or write plainly Address



TROPIC HEAT OR ARCTIC COLD YOU'LL START AND YOU'LL GO!

When a fuel pump has been tested under strict government

supervision and found to work perfecily at 114 degrees above zero and at 76 degrees below zero, we think it has proved used the best on the market. That a what the Bondin's Electric Fuel Pump did. Positively eliminates vapor lock. No other pump even close to its price class could match it. Better get one for your cur. (Send for free illustrated a PRES. B.H. PAT. OFF.



Bendin

(Eclipse Machine Div.), Elmint, M. Y.

34 POPULAR SCIENCE

Plagued Day And Night with Bladder Discomfort?

Such a common thing as unwise eating or drinking may be a source of mild, but annoying bladder irritations—making you feel restless, tense, and uncomfortable. And if restless nights, with nagging backache beadache or muscular aches and pains due to over-exertion, strain or emotional upset, are adding to your misery-don't waittry Donn's Pills.

Doan's Pills have three outstanding advantages—act in three ways for your speedy return to comfort. 1—They have an easing soothing effect on bladder irritations. 2-A fast pain-relieving action on magging backache, headuches, muscular aches and pains. 8—A wonderfully mild diuretic action thru the kidneys, tending to increase the output of the 15 miles of kidney tubes. So, get the same happy reitef millions have enjoyed for over 50 years. Ask for new, large size and save money. Get Donn's Pills today I



ATE AUTO CHROM

NOW with any NEW POSTABLE SELF-POWERED GUECTROCHEMICAL Outst Year can easily its your year platting. Not a passet No. a hard duration metal plate, event in commercial plateing that your own matting life. with instructions the planting Cod state away profiles like with instructions the planting there's and have been profile. Aske there's a loveways Jewelry have getter and list' other articles with Chromos Michel. Commer, Gold, etc. SEND no MONEY Every bear and 111 for the low price of ONLY 5. Plant acted 55 to have and receive it profiled. Money back in 7 days if not entrance in R had Encoded in 7 days if not entrance in R had Encoded.

New York 36 N Y



Telescope Lone Kit

Conquer Note: Faptore the Universe Plancis, Mona system. New Start, etc. I complete Lens & Compute of all inch front length ground and polastical objective Iran. Speciment for 60 INWEST IN POWEST, Let er
BUSSE SALES CO., Hartford, Cons., Dept. PS-47

When Writing to Advertisers Please Mention Popular Science



and ALL SUPPLIES

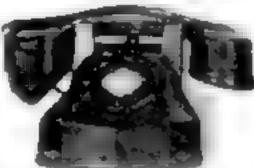
Room to room house to e varage private te ephone sert op

HANDSET CRADLE TELE-PHONES (2) Complete putting in 1 60° ware but The 2 Win 23

WORM HARVESTER Dea Mar Marrett by Electricity. Complete with instructions \$4.50

FREE Dissertated booklet.

TELEPHONE REPAIR & SUPPLY CO 1750 Luni Ave...



Chicago 26. III.



Bird Boths
Jors and Vases
Flower Boxes
Flogstones
Lawn Seats
etc. etc.

Spare-Time Income from Gardencrete

Wherever there's pride of home, there's a place for Gardentrete. That's why the sales field is so broad, and so rich in profit potentials.

Gardenerete is basically made of cement and sand, then Colorgiazed in a choice of 30 attractive colors that stay new. Easily washed or scrubbed. Add beauty to every lawn and garden.

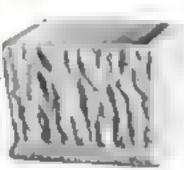
On a small investment for molds and Colorglazer you can develop a line of products that sell for two or three times your cost of materials and labor. Easily made in shed or garage. We supply full instructions.

Write for book "Make Money." Describes equipment and gives figures on costs and selling

prices on dozens of different items.



The Bird Bath shown above setts for \$8 50 Cost of materials and labor \$2 25 Your mark-up, \$4 25.





MIDWAY COMPANY, Dept. SPS 5, Rearney, Nebrasha





PORTABLE MODELS

500 to 10,000 watts. Supply plug-in power anywhere! Start automatically when highline power is out off, supply current for lights, heating system, freezer, water pump, slove, all appliances and machines. Prevents losses and hardships. Plant stops automatically when power is restored. Compact, easy to install, 500 to 75,000 watty A.C. Priced from \$319.00.

Write for Free Felder

D. W. ONAN & SONS INC.

MAY 1958 35



will back. Com date of discharge

A "Must" for Home & Shop Sensetional "Little Glant"

FIRE EXTINGUISHER 40% Greater Content! Lightweight! Lifetime Guaranteed! Fooiproof! Features Revolution Any new Imper efficient OUPGNT Chemicals!

only \$4 95 ppd.

(2 for \$6.95)
If his breaks out at home about other home about office book car of store the proved FIRE FATTY LISHER can and 2 serupted Just p at pur turn of the precious made brane ware and the bob in done. The fight weight Lit e tout an authorized weight Lit et aunt an authoriset ed of tagithy polluted forman and a Magnather. For other The potent forpers them call du a thermaph polyter and than a first will not them each aft has a first will not them ago and maleria a The I file lant 'requires no important of reclarating The premare requires remarks for premare the industries of the first them and the premare that I make the formal for the premare that I make the first them a first the premare that I make the first them a first them and the premare that the premare the premare that the premare the premare the weight ed of t exhausted evenes county car go with \$1.55 and we'd school a completely now battle reidge



Perfect for werkship of fice plant heate gurupe photographs 4 highest fire plant plantageness Malabate Sabigi glemonds nickel maket blens duty glequiting riched socket blegs duty opting clamp with white cultier grigo that accure y facton to any propertiest for institute his a minimal to give you already y heatlon feet lighting. Force way adjustable foul. the give you stends a brother for another to give you stends a brother for the brother for the sound society as the period to seld he of light to any direction. Six feet tight to any direction. Six feet mibber covered III. Approved Α. sated mediated plant \$2.49 3 for \$7.00 ppd.

Completely Adjustable WORKBENCH LAMP For Shop, Inspection Beach, Machine Tool, Loboratories

Smirels and angles in any concertaine direction formanteed to haid your tash cancily where want if because 3 arms 2 72 To haid your timbs cancily where you must it because 3 arms 3 to part at part on 3 told joints. Easy to mount anywhere Takes up to foll must said blue 6 foot song wearing measureme could and play Finished in pale green with reflector the de to permanently \$4.05 attached a magnet now \$4.05 attached a magnet no



Lifetime Grit Handy Sander

Tungatra Carbide Brit Brased on Steat. New Hite

time abreated on the transfer car bide is to breased on steel gives a discrete the rest in brothest Perfectly in the cott as backers. Perfectly in the cott as backers plantic of composition related a light of all posts of wall body. Note heart replacing all was stays sharp wants blice as fast to another wally about the light and the another or does not true like among paper. Last ye another backers are true to a light another than the samplest above and the samplest above and the course gett above and \$2 00 course gett show and plus 20c on the fine g it show Lafe hours. FIRST PAR time marasteed

Ford Professional STETHOSCOPE

Strand new famous Fined Pro-front ness: sensorier Ste hoseope designed for pigaletans. Ideal be einelemten 407 For nee three three per to the to the three


PRECISION MICROMETERS

At Bargain Prices!

Chrome plates, so per abor equipment with retrieve store and rack must Adjustable for some freeze between evaluations of functions, a sea distants on frame blockward frame to at owners are light apole. Precision made for accounts resultings facily put shed in several based case.

to the latest strainer \$7 95 and. 17 mm" 5€ 95 mm. Send Check or M O. C O O les sates MGNET BACK QUARANTEE SCOTT-MITCHELL HOUSE, INC. Dept E 3 41 E Brandway

FABULOUS, NEW

Twist Into A Thousand Shapes! S GIRAFFES DACHSHUNDS - Pers of All Kinds

Made of Live Lotex

Add 25c Fastoge Handling 4

Delight Kiddles — Grewn-Ups, Tool

B+ E B*

fontastically Hearble Live Latert O Life no other bolloons you we ever wen I break! Cut them in half or any twist and they respect The kiddies will have a whale of a time making them into Davy Crackett hots, pretaels, graffes, lieng fish — a whole sool Toy II want them for proqual party or retreation room decerotions! Liven up a party with a context for making the funniest shape of all Complete instructions.

Almost 5 feet long when inflated. Balloans this size visually self up to 23c each?

Sand only \$1 new. Plus 25c poologe and handling for 200 in a variety of pay cotors! Supply limited at this low price, so or several sets NOW for GUARANTEES PROMPT DELIVERT MONET HACK GUARANTEE.

MURRAY HILL HOUSE

Dept. B-13-A, P. O. Sex 251, Sethpage, L.I. N.Y.

EARN \$100

BE AN AUTO-DIESEL **MECHANIC...EARN** WHILE YOU LEARN

Many of our graduates earn \$100 a week and up. You learn fast in our school and shops because you learn with tools on real equipment Experienced instructors expining WHY and show you HOW, then you DO IT YOURSELF One of the best equipped technical schools in the United States Thirtyhite years expenence training men Successful graduates in 48 states and many foreign countries Approved for Veterana Day and evening classes. Free bulletin-write today

NASHVILLE AUTO-DIESEL COLLEGE 226 7th Ave. N., Dopt. 42 Nashville, Tenn.



make your own flows 3650. The Gem Maker comes compared with all necessary continuent in toding a super harged diamond tidate for making and all the wheels for grinding, sharing and polishing appropriate forms those. The sumplets superposed as sharing less motor and bet for only \$10 km, for by the forms, Windowskin Write the day for information and there. day for information and itera-

BAI MANUFACTURING CO.





LOW COST HOME TRAINING COURSE FOR BEGINNERS & ADVANCED CRAFTSMEN

Make money. Learn skills and secrets of fine woodworking and tool use. Professionally prepared shop method training tells and shows how. Covers everything. Easy to master,

Write for free Bookle INTERSTATE TRAINING SERVICE DEPT. F-2, PORTLAND 13, OREGON

LOWEST PRICED .22 Col. REVOLVER AVAILABLE MEN'S Shot 27 Years Goodle Series MALY \$15. DE --- \$29195 Yelou

Outy Outliney Close could find a genuine 22 Cat Breaker takey for 3' 5 91 Small 325 Puppy 22 Cat Oline Specime can be pleased here your purchase on the Can be used for facts mg or trapping! Salid treat borns give deserts on teracy Guick gray harolley. A fast handing doublenames. Just pull the trugger to fee

resit: dan of 32 Short Cartridges with all orders. Order by Mail Today . . . Send \$5.00 desce, Bol. C.O.B.

SCOPER MPORT COST., Dupl. P.-S., 241 Broadway, N. Y. 7



BE FREE FROM TRUSS SLAVERY

Surely you want to THROW AWAY TRUSSES FOR-EVER, he rid of Rupture Worries. Then Why Do you put up with wearing a griping, chafing and unsanitary trues the balance of your life? If you do, it will NOT be through necessity but through choice on your part.

Now there is a new modern Non-Surgical treatment that is designed to permanently correct rupture. These Non-Surgical treatments are so certain, that a Lifetime Certificate of Assurance is given. Write today for our New FREE Book that gives facts that may save you painful, expensive surgery. Tells how non-surgically you may again work, live, play, love and enjoy life in the manner you denire. There is no obligation.
Excelsior Herela Clinic, Bept. 3785. Excelsior Springs, Me.

DILAYO men skilled LEARN AT HOME . . . QUICKLY . . . IN YOUR SPARE TIME!

benefits enjoyed by mon with a C.E.I. diploma.

Strikes and levelle are nightmarks of the post, C.E.I. training opened the door to a wanderful future for me and my femily

H Oeftering, Ohio

My C.E.I. training has odvenced me from a job as m laborar to a gassion as ir. Engineer with his pay increase.







The apportunities available to well-trained draftsman were never greater! The President is deeply concerned about the shortage of technically trained men such as draftsmen. The need for skilled draftsmen is tremendeus and is growing doily. This vital shortage has existed for 15 years and will continue for at least 20 mere years. Never has such golden appertunity been offered men like YOU!

Job security, ropid advancement, big pay checks are only a few of the many

Drafting is the only field which makes it possible for you to obtain easily, without any special background or experience, a professional, well paying, secure, important future. C.E.I 's staff of licensed professional engineers show you how to goth this wool in only a few short months of spare time study! What a Cleveland Engineering Institute diplama has done for thausands of others, it can do for YOU, too! Write for full information today!

AKTHER WAS TRANSPARED AND

FOUR CHOICE OF FAST LOW PAYMENT PLANT, NO CARRYING CHARGEL!

PROFESSIONAL CONCRETED. ABO THEFTCHER 40110 10 10161



CLEVELAND ENGINEERING INSTITUT

CLEVELAND ENGINEERING INST., DEPT. PS-5H 6300 Euclid Ave. Cleveland 3, Ohio! Please RUSH my Free Success Book and Lessen I Aeronoulicai Mechanical NAME

ADDRESS

CITY STATE

Na Obilgolien - Ne Salesmen

HERE'S A MONEYMAKER FOR YOU!

make up to \$3 or \$5 an hour with the FOLEY SAW FILER

Ask yourself these three questions: 1. Do I really want to get shead faster? 2. How can I do it? 3. Am I willing to use my spare time? If you answer "Yes" to questions 1 and 3 - then we have a positive answer for you on No. 2. Men make up to \$3 or \$5 an hour sharpening hand, band and circular saws with Foley Saw Filers. No experience needed, to turn out sharp, smooth-cutting saws with this automatic machine. Start in spare time—no canvassing.

HERE'S THE WAY TO START

Read "Money Making Facts" -- shows you how others have added hundreds or thousands of dollars to their incomes in this steady, repeat, CASH business, Start your own business in your basement or garage. With time payments the Foley can more than pay its way right from the start, Mail coupon today for Special Summer Discount Offer, No. salesman will cali.

HERE'S FROOF

"When Mr. Patrick he made a good and wonderful investment, He has done to well that we bought a house and pold for it; bought addition to our house, Nicest of all, it's all paid for." Mrs. Leslie Potrick. Hough,

got his foley Saw "I made \$765 last Filer in March 1946 Vede filing same, and Year filing sows, and handy. I do this work in my spare time." - James 8. Williams

"Last year's profd new cor, built on it amounted to \$3,000. Not so bod for a one-mon out-

"I have done 4 or 5 thousand saws in my spare time in the 4 ½ years since I got the outhl, and they are all coming back fit."-Charles C. with repust orders." -Lan Crapo.



FOLEY MFG.	. CO.,	519-8	Foley	Bldg .	Minneopolis	18, Mir	ıp.

Send me free book "MONEY MAKING PACTS," Time Payment Plan and Special Symmer Discount Offer

DELS GUIDE



A CUMPLETE MONE STUDY COURSE - Starting with the first parameters of archive relaxant ong step by sing through the various trages of mathematics sucleating the rules and categorial includes for methans at and everteen plane and the EASY correct methads includes plane and tested according to the categorian and the description of the categorian and the ca

Die, prochend bech growthall bringmatus milt some pro-leg glagradia. Course pro-chiplet, months des egal-cies servad and epale of case the by and on his Grand Engines, phytomatics, and Found bring talls are and Fried Bries fulry en f



CHOLD No. 1 IN COUPON

7-DAY FREE EXAMINATION

SAND AND WHITE Pay the painting to 15-age We il speed who give by the facts. Go day the FRE manmitted by the part however in a side to kamp he beeks pluy thay any for these proper part daily pay plus of only is a more the

PRACTICAL

ELECTRICITY OF ALTERIOR CONTROLS OF THE PERSON CONTROLS OF THE PERSON OF information on the rules and over of electricity throughout a st Mark norm of the last OC Marks for the last over Prices to E3 Colcut No. 4 III Empres

REFRIGERATION & AIR CONDITIONING

FOUND BOOKS IN ONE BUTHE COMB BOOKS IN ONE Report printerpos Street, and the printerpos of 2. Newself Ind delingeration 2 Source of Printerposition of the property of the control of the property of the control o

HIRE IS THE AOM DO

47'S EASY FOI ORDER on the New York of Mar. Employ Colonia for the second of the processor of the second of the processor of the second of the We as not of the to population of production for the production of COMPLITE CATALOG SINT PRICE

CHICK MIDW

MAIL THIS COUPO TOD/

FIRST. AUDEL B. CO. - Self Improv 49 W Shed Street, How York 16, 30. T.

Please mail one for I stays. FREE EXAMINIATION the backs I have elected. I open to mail \$2 in 7 days on each book or out reduced and to further mail \$3 a family migach back or not unlarged quality have paid the providing price, paid objecting conta. (I I am not prophetely antisping with my Angled Candry I may return them.

ADDRESS.

OCCUPATION.

DIMPLOYED BY.

1 6 11 14

[7] Chech Jers for Free Complete Catalog.

SAVE SHIPPING COSTS! Clock here If you ender the proseed with order. We pay poorage thought. You have some return printings.

BECOME AN EXPERT IN

TRAFFIC and TRANSPORTATIO

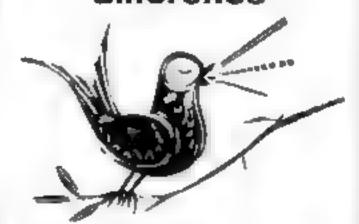
Traffic men sern \$4 000 to \$10 000 and up. Theorems of firms accel experts on rates, parific regulations. We trade you thosely as spare time at home for executive traffic pole. Personal training under traffic authorities. Write for free book. Traffic and Transportation

LASALLE Extension University, 417 Se. Bearborn St. A Correspondence Institution Dept. 5637 Chicago S. III.

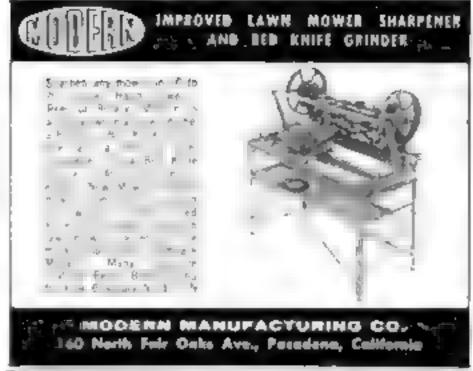
Sonotone.

HI-FI SPEAKERS

you can hear the difference



Even the price will be music to your ears... Model CA-12 only \$1950



安全的 [GET INTO PHOTOGRAPHY

Coast to coast, high-paying John to photography are waiting for people with that "know-how" to fill them You can quickly, easily quanty at home with the worldfamous NYI Learn - by - Doing Method Write today for free eatalog. Also resident framing in N Y 48th Year Approved for Vets.

NEW YORK INSTITUTE OF PHOTOGRAPHY 10 West 33 St., New York 1, N. Y. Dept. 5

100 POUND SET 1 1.30 Extra Plates Only

140 Council CHROME DELUXE Her This is sure few are not about a the finest ever

BEND FOR FREE CATALOG BUR BARBELL CO. **Eyndhurst S, New Jarsey**



EARN WHILE YOU I ANN for met BOOKLET

LOCKSMITH i e 0

Luarn fassinating, profitable trade from experts in eguce time at home! Age no dis advantage. Year found steady income Full or part time Practical Hiberta ed lessons. Make money even while learning! All materials and special look supplied

Locksmithing Institute, Dept. PS-101 150 Park Avenue E. Rutherford, N. J. Lie by N. J. State Board of Ed. Appred for Yets.

Northrop Institute in Southern California prepares you for highly paid positions in Aviation and Electronic Industries. Employment assistance during school and after graduation. Approved for Veterans.

Write today for FREE CATALOG

NORTHROP AERONAUTICAL INSTITUTE 1157 W. Arbor Vitae - Inglewood 1, California

How to have the best looking haircuts in town for a dime!

IF YOU CAN COMB HAIR YOU CAN CUT HAIR WITH NEW SUPPLEME ELECTRIC HOME HAIRCUTTING KITI

Now you can cut kids' hair at home and get perfect haircuts every time with the new Supreme Electric Home Haircutting Kit. It is the quality kit specially designed for fussy folks. It has everything you need for professional results . . . including a crew-cut attachment that works on a comb principle. You simply "comb in" a perfect trim . . . give Junior the best crew cut he's ever had! And Supreme can help the man of the house keep that neat, fresh-cut look-make haircuts last almost twice as long.

Divide the Supreme purchase price by the number of haircuts a family of four or five ordinarily gets in 2 years. This brings the cost of each Supreme haircut down to about a dime. Get a Supreme Kit today and start saving more than \$50 a year.

New Supreme Kits have everything you need for professional results?

Complete Supreme Kit shown \$14.95

On sale at drug, department and hardware stores







AMAZING MUSIC DISCOVERY

-even if you don't know a single note now?



Now it's EASY to bearn ANY INSTRUMENT—even if you don't know a single note now No boring exercises. You play drightful pieces RIGHT AWAY—from very first lesson! Properly by note Simple as A B C You make amazing progress—at home, in spare time, without teacher same way TV Star Lawrence Welk did FREE BOOK this thousand have easy a lot learn music light on the sale same way it call upon you U.S. School of Music, Studio 155. Port Washington, N. V. 160th successful year.)



You get BIG FUN . . . BIG POWER in the new Amazing "Slick-Shift", the new, com-

Get more fun out of hie! Mount a sleek and powerful Triumph . . . show your pale what fun-on-wheels can be like. Features Continental economy, models average 75 to over 100 m.p.g. Triumphs are precision-built, designed. for ultra-high performance. Available in racing, road and cross-country models. In brilliant colors with sparkling chrome.

See your Triumph dealer for a demonstration ride. The Tiper T-110, 40 cm, in. (450 c.c.)



Places send me the new 1958 full color Triumph catalog showing your complete range of models with specifications.

Check here for pume, address and telephone number of negrest Triumph dealer, Dapt. M-Z In the Westy JOHNSON MOTORS, INC. 267 W. Catarado St., Pasadona I, Cal. to the East: THE TRIBBER CORPORATION Yamesa, Baltimera d. Md.

ivatel	
MRÉÉI	T

TELEPHONE NUMBER.

DRAFTSMEN



CASH BIG PAY CHECKS!

Train Now for more success, greater security

LEARN AT HOME IN SPARE TIME (or at college in Chicago)

Check the want ads in any newspaper—SEE the bigpay opportunities open to you as a draftsman. What's more, you can learn this well-paid, prestige profession at home—quickly, easily! No special talent needed! Get complete, step-by-step Chicago Tech lessons in the mail, spend a few pleasant hours studying each week. In a short time you'll be a well-trained draftsman, ready to take your pick of many good jobs. Act now'

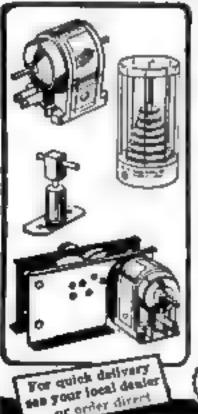


FREE INFORMATION MAIL COUPON TODAY!
Get FREE TRIAL LESSON plus information about C T.C. practical training.
Learn what successful Chicago Tech graduates say about high pay and opportunities in drafting. No charge, or obti-

CHICAGO TECHNICAL COLLEGE

E 226 Tech Hidg., 2000 So. Michigan Ave. Chicago 16, Illinois Mail me FREE Lesson with information about big opportunities in DRAFTING.

ELECTRIC MOTORS—KITS HELP TEACH SCIENCE FACTS



Applying electric drive to research and hobby projects combines pleasure with instruction. W lede a motors and k.in w. I help you learn bante acceptable facts canby.

No. 8-100 Itl Drive Motor. 9- nV 12.50 Mo. 9-400 Hame for 12V \$3.00 TNO. 3-100 Tiny Atom Motor.

1 th 3 th 12 00 For dV \$2.50 For 12V 93.00 140. 14 Adjustable abut.

Abprove kill 93.00 *No. 77 Set of 7 large pulleys \$3.00 No. 1300 Small accessories his \$1.00 No. 3700 Large accessories hit \$3.00

No. 4000 De Luye accessories An with motor 59.00 PMo. 3000 Vari speed genr unit \$4.00

No. 1046 Gear frain with HI Drive motor 50 8 100 Same with No. 9-100 Molec. \$6.48 Item Diustrated, Ask for PREE Cat.

All motors have ALRICO markets

Remit with order and we pay postage in U S A No C O D. AND 3% Sales Tax for delivvey in Ohio. Write Dept. PS.

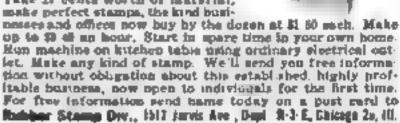
WILSON'S OF CLEVELAND

- or other direct 425 Lukasida Ave., N.W. . Cleveland 13, Ohio

New Table Top Invention Puts You in

Home Operators now make \$9.40 AN HOUR in business once monopolized by a few big companies

Special rubber stamps bring high prices cost only pennies to make on new, few-cost table top muching, Take 27 cents worth of material,





. . . Swiss or American

Unique Sweazey System starts you making repairs right away Develops your skill step by-step Teaches modern methods professional short cuts. Learn by personal attendance or spare time home study. Free Sample Leacon. He shifts-tien. Write leday!

CHICAGO SCHOOL OF WATCHMAKING 2330 Milwookee, Dept. 458, Chicago 47, Ils.

ELECTRONICS

Teta in communication guided minister computers, automation Havin & advanced courses in theory & laborationed degree in the property of processed Caduares with many companies. Start hept processed campus N.S. graduate or equivaent Catalog. Assoc deg approved Dorme e

VALPARAISO TECHNICAL INSTITUTE DEPT. \$ VALPARAISO, INDIANA



Trate quickly in 5 short weeks at Toleda for a bright future with security in the rival meat business. Bug pay fail time jobs HAVE A PROFITABLE MARKET OF YOUR OWN! Pay after graduation Diploma given, Joh help.

Thousands of successful graduates. Our 86th sear! Send YOW for Fifth cutaing, No obl Ellish G T Approach NATIONAL SCHOOL OF MEAT CUTTING, Dept 51-D, Toledo 4, Oble

PELLET FIRING "45" CALIBRE AUTOMATIC

Magazine Loading Clie & First & Rounds

• 15 Moving Parts

• Fully Automatic

Automatic but high reports of high go wired 1/4211

cut bre cords marred to having buttle loads breightlete

rounds in makes no clie which among total had but the

army to First he set the period to had butt the

army to First he set the period had buttle act no.

LEARN THE WORKING MECHANISM OF A 1/4511

ares to you discover sed with a life which my \$1.98

before of a 14. Constitutes in a life and for a 1/451

areatons are lifetoned pills full singlet of period

and man-sine authorate buttle full singlet of period

and man-sine authorate full singlet of period

BARGAIN (GUN) COMPANY, Dept PS-S, One Park Avenue, New York City

New FAN - Shutter -- Meter -- Catalogue



Procked with the Largest Selection of Fan equipment. BUY FROM MFR and SAVE 50%

ATTIC FANS & DIRECT DRIVES Fontex & Torrington Fons & Kits

• Attic Fans • Exhibit Fans • Pedental FANTEX Blade Kers tal Fans • Shutters • Molors • Tub Sizes WT. List Enclosures • Sewing Machines • 188 14-7 (Un. \$15 till Blade & Attic or Window Fans Fan Kit (Includes): Sizes Blade - 2 Pullsya-2 leas a Attic or Window Fank Fan Kit (ncluden: Strei Blade—2 Pulleys—2 Bearings—2 Collars—Shaft—Instruc-tions—Easy assembly.

VISIT US OR SLAD FOR FREE COFT Enclose postage with theck of money order flooring landed

TORRINGTON Blade Kils 22" 171's 615 90 512 24" 20 lbd 30 1 15 24° 30 lb4 95 35 70 27 Jo 1 2 1 lbs. 25 lbs. 311 lbs. #1 40 42 56

ALBIN MACHINE, 423 Brooms St., N.Y.13, N.Y.



NO OTHER CRAFT OFFERS SO MUCH—FOR SO LITTLE INVESTED

Tandy now affers a complete packaged Leathercraft Kit, with everything a you need at a very LOW COST Leathercraft is easy, profitable, and fun. All you need is a table, your funds, space time and this Kit.

You can corve and assemble these 9 beautiful practical, quality feather items that have a ready re-sale market. And while you're making 'em, you learn the basic fundamentals of

Leathercraft — a hobby that will offer you years of enjayment and profit.

Only through Fundy's massbuying and manufacturing tocilities can such a BARGAIN be available — the savings are passed on to you! This is your appartunity to get into Leathercraft , NOW!

Your Spare Hours Made Profitable

With TANDY'S FOUNDATION of LEATHERCRAFT 9 TOOLS - 8 Genuine Leather KITS



TOOLING COWHIDE LEATHER JUTS—keedy to essemble and tool. Make these beautiful natural feather items for re-sale or year own use. Procision cut, locang-boles punched, snaps attached, full-size photo-carve pattern and asstruction sheet with each life.



WRITE TUIL COMPLETE TO PAGE TANDY LEATHER CO.

P. O. Box 791- Ga

WE DON'T KNOW

all the many uses for thme prisms but we do know 1000's ed
people are finding them useful & fun — how shout you?

WI. Ve to.

PRISMS
\$1.50

Mase for 1 A
Gov for cark
(ser scapes Fine op
these points with a heared
hasy Terrate for all prises of
these on the prisms with a heared
hasy Terrate for all prises of
these on the open with the higher on
the op references to ploce for mantal You is find many other
there NYW PRISES TO use C S Govt \$25 on Now \$2.50 so.

OCCUME SALES CO.

SOLO SUBSILES TO ANGELES 29 CALIF

CATALOG



EARN MORE-LEARN TO BE AN

MECHANIC

OR TRAIN WITH OTHER GREER DIPLOMA COURSES

- AUTO MECHANICS

 DIESEL MECHANICS

 DOOY & FENDER REPAIR

 GAS-ARC WELDING
- REFRIGERATION
 AIR CONDITIONING
 MACHINIST TRADE
 ADVANCED MACHINIST
- PIANO TUNING & REPAIR

Skilled men are needed in every part of the country harn top pay in established shops of start your own business Green's expert asstruction and actual shop training teaches you how how sears by doing—quicklessy courses using the latest tools and equipment. Day, evening and part time instructions available.

Job placement and convenient living accommodations are yours while training. Contact GREER & FREE JOB PLACEMENT BERVICE when you entoil if you wish part time or full time employment

INDUMERANT TRANSPORTED

DIESEL AUTOMOTIVE ENGINEERING 27 MDS.

REFRIGERATION & AIR CONG. ENGINEERING 12 MGS.

WELDING ENGINEERING 18 MOS.

STREET

All Courses Approved [Civ. or [G.1.

Please rush me free literature on Auto Mochanics, oon the trade indicated, at no obligation

NAME AOR

TOWN ZONE STATE
Established 1902

GREER SHOP TRAINING

Box E, 2238 S. Michigan Ave.



America Historical Book gives floor plans for it untentioned macrois bines burnten. flore. Falls from the day blacks, day not building dead, and denoteds, build steps, parch and reasons, thous all at great derings. Written by exports. Can ture away times the said of the machine Got II coul the strings attached. Speed \$1,

BOOK SENT FIRST IN YOU BUT MACHINE, BI DIFUMBED IF YOU BUY LAIRS.

GENERAL ENGINES CO.

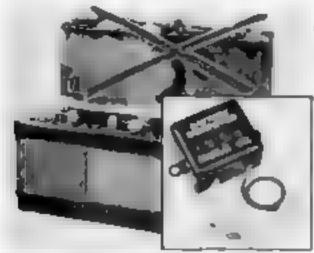
ROUTE 130, THOROFARE, N. J.

ment coul civator hinchs supplied with sauth courtiess.

Write for PRES folder with hell return

New electronic miracle . . .

STOPS BATTERY TROUBLES!



... Automatically Re-Charges your Car Battery Every Time you Start the Engine! only

Now . . . you can say goodbye forever to "no start" mornings. to bettery charging bills, to the expense of replacement bat-terios, and to the nuisance of continually re-adjusting your regulator. The wonder of electronics brings you an electricity new concept in the automot ve field that will save you many times its trifling cost by keeping your present battery in ex-collent working condition indefinitely! The remarkable Electronic Battery Insurance Computer controls your regulator and generator system to restore your bettery to full charge quickly and automatically insures that your voitage regulator constantly compensates for normal battery
sging . . ALL AUTOMATICALLY! Easily installed with only
a scraw driver Fully guaranteed.

					rod.	AY	 _
P.O. Box 31	, Redoc	do Ba	ech,	Celk			
Rush Hatter Make of Ca							
Name .							
Address							
City			Zone		State		



FIX OUTBOARD MOTORS

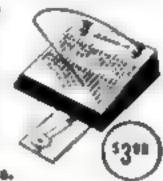
POWERMOWERS, AND ALL SMALL 2 & 4-CYCLE GASOLINE

MAKE EXTRA MONEY - or repair your own equipment and SAVE! Fully illustrated, easy to understand. Home Study Causse. Write today for FREE information.

LINCOLM TECHNICAL INSTITUTE SUITE 5-G 472 MARKET STREET, NEWARK 5, N. J.

LEARN CODE THE E-Z WAY

New . . , E-Z CODE Jr. uses electric pencil and printed-wirling. Draw electric pencil down lettered slot and buzzer sounds dots and dashes. Operates on single Hashilght battery At your local radio parts distributor. Write for free code booklet and name of your nearest store.



AEROYDX CORP., New Bedford, Mass.

HYDRAULIC JACK REPAIRS

Earn While You Learn at Home

Mi hore of the in the & subserver enturns tru here tody shops riggers, factor os farms next servicing the show you HOW- easy step by try directions what todie to use EARN UP TO By the hour is spare the in your dwa basement or garage Sign your own business NOW Write for solder No PK & free boths offer

Institute of Hydraulic Jack Repair

P.O. Box 50, Bleamfield, N. J.

--------1,000,000 IN CONFEDERATE MONE)



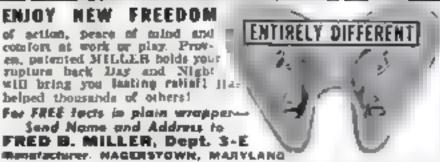
Be a deep-south millionaire with money to burn. Ton can do everything with this money except spend it, A million bucks in \$10 s, \$20's, \$30's, stc.

in hourst to goodness authentic repro-ductions of genuine Confederate mon-er plus behas bills. Light your eigerettes or eigers with a ten-spot. You get a million for \$2.96 or four million for \$10. Postpaid, Best Values Company, Dept. M-168, 403 Market p Street, Newark, N J.

ENJOY NEW FREEDOM

of action, peace of mind and comfort at work or play. Provsupture back Bas and Night will bring you lasting ratiof! Ha helped thousands of others!

For FREE facts in plain wrapper Send Name and Address to FRED B. MILLER, Dept. 3-E





Using too much oil ?... call for HASTINGS

Excessive use of oil is your first sign of wornout piston rings. And worn-out piston rings mean power drop-off-costly wastage of gas and oil-expensive repairs later on.

See your motor specialist the minute oilpumping warns you there's trouble ahead. When he recommends new piston rings, ask for Hastings. They're engineered exclusively

for replacement service . . . to stop oil-pumping, save gasoline, restore lost performance.

Get new car performance from your present car-with Hastings. Truly your best investment for thousands of extra miles of trouble-free driving. Hastings Manufacturing Co., Hastings, Mich. Piston Rings, Casite, Wear Reducer, Oil Filters, Spark Plugs

TOUGH ON OIL PUMPING GENTLE ON LIZINDER WALLS ...

HASTINGS. PISTON





FILLING MOWING

Free Cutolog LOW PRICES Over 30 Years Experience

FULLY <u>CUARANTEED!</u>

attachments available!

1916-A S. 81 ct Street



Send That Broken Wetch

watch reabed obed All heressary parts era need wind my watches (neighed) Prompt Service Guaranceed

Timers and \$100 watches Extra prices apost request. We reserve the right to return but her beyond rope r Save COD charges. Send check or money order with watch to: SIERRA WATCH REPAIRS 75 NE 195 St.

NEW . MIDGEL DOOKL MAYE KADIO



Tunes All loreign abort wave bands, London, Paris, Mascow Australia, All Athateur hands as to be in prevent all long distance Ar Force and Ar I be sirving that you have been at the founty lone Ar waveness breaking to the founty lone Ar waveness breaking to the founty lone Ar waveness breaking to the founty lone are as the founty lone are are also later and are the founty lone are as the founty lone are are also lone and the founty lone are are also lone and the founty lone are are also lone and the found lone are also lone are also lone are also lone are also lone and lone are also lone and lone are also lone and lone are also lone and lone are posterior and lone are also lone ar GETS STATIONS 12000 MILES AWAY!

WESTERN RADIO Dapt. BRS-II KEARNEY, NEWS.

ENGINEERING



Photo of Heald Student in Electrical Laboratory **Enroll New for New Term**

Hoold Collean Ranks FIRST West of the Mississipple in "Who's Who in America"

Send for FREE Information Piecus send by air. Thanks

Heald Engineering College Est. 1462

You Heat at Post, Bept. P.S. 558 Sam Francisco, Culifornia

STREET __ CITY _ STATE

American Industry Steps Up Its Demand for Trained Engineers. Train Now at Healds

BACHELOR OF SCIENCE DEGREE,

H ghway Engineering	4
Structural Engineering	ing
Diploma Courses: TELEVISION Di Colec Electronic Technicium	ŀ
Industrial Electronic Fech. Tool & Die Design Architectural Orofilm	
Mechanical Drafting Structural Drafting Survey ng Estimating	
Moster Electricion Approved for Veterans	•



MOTOR CURE

stops

SAFE, PURE PETROLEUM BASE SEALANT

Just pour in motor oil, MOTOR Cl RE, with exclusive "Cushion Placing Action hills in, plates and seals in and around the rings and cylinder bores—and all internal engine pares. Oil cannot bypass rings and OIL BURNING STOPS' MOTOR CURES lusting oil film seal raises compression increases oil pressure = quiets tappets, valves and lifters ends cold, dry starts e seals out friction e im- \$195 proves oil viscosity . assures 100% lubrication 16 fl. ozs. at all times. MONEY BACK GUARANTEE

TRANS-CURE

stops transmission leak



 Prevents seals from drying, hardening or sheinking . . . Keeps seals soft and pliable . . . Swells and coats around seals and gaskers

TRANS-CURE improves performance and smoothness. One can in transmis-sion oil assures NO SLIF - NO JERK -NO HOWL - NO SHIND!

BOTH MOTOR CURE and TRANS CURE are backed by \$250,000 Products Liability Policos with one of the world's largest inturonce tomponies

MONEY BACK GUARANTEE 5-345 16 fl. OTE.

Get MOTOR CURE and TRANS-CURE at your negrest service station, garage or auto accessory store. Or write to

Kepre Corp., 2329 S. Michigan, Chicago Té, III

PLANS - PATTERNS - FRAME PACS

World's Enryest Selection. Over 200 new plans, Full Size & patterns, frome peas, Designed for the ameteur. Froms, a recent, project, of star, lehands, without, in word . psycholi, steal, Piew langitudes) straused models with revolutionary buildhead construction slight, supper strong-

Send 35c for 120 pg. PLAN CATALOG®

SPECIAL OFFER . s. a. Hon Cotolog . s. plus Hardware and Accessories extelling

CUSTOM-CRAFT-BUFFALO ZM NEW YORK

120 PAGE PLAN CATALOG PLUS 200 PAGE "BOAT **BUILDING FOR THE** AMATEUR: COVERS BOAT BUILDING FIBER-GLASSING OUTFITTING, ETC.

Only \$2.50



Leather Sheath

World's most fabulous hunting knife! Over 100,000 sold for \$3.95. Now this genuine Black Forest Knife yours for only all cents. Extra thick, high carbon tempered Korium Steel-can cut thru metais! Sharp enough to shave with. Gives lifetime of rugged service, Hundreds of uses: Slons moose, rabbit, deer; scales fish; cuts hemp, wire, underbrush, branches—even metals! Carves roasts, turkey, steak. Also use for impressive den decoration. 10 inches over-all. Hand forged by legendary sword makers proud of their and ent craftsmanship. Send only BBg plus 12¢ postage for prompt delivery, 100% satisfaction guaranteed or money back. THORESEN Inc., Dept. 7-E-78

585 Water Street, New York Z. N. Y.

BRINGS YOU \$18

Discover Flok-Kraft and Earn \$\$\$\$\$ AT HOME

Earn up to \$15 " per hour spare time Amazing new Yo vot-flor ray in the y makes and object (lam, s. Radio & TV Cabuses Four new Societ Auto dash boards mys furniture draintness and bug with ex course \$4445 Prices. The make you can stray at him who thus beautiful new suede-liber to shifter that he right Velsco.

EARN UP TO \$300.00 PER WEEK SPARE TIME

Imagine materials cost only the per square foot (Average TV or no or except to inaquate by a code to the security them to be at a cost of hill). He to make at a cost of hill the form of makers at Your charge for this job is at least file file.

REPRESENTATIVES IN YOUR AREA URGENTLY NEEDED

Own your sown bus the Work at home if your space i me Help bill the huge grin of demand for this a native new benefits belts free do so is before any from mores. We as homes ar-chisects at a dealers everywhere Pos his \$20,000,000,000 mirth of these to be done investigate to my—be first in your

Actual same es in 15 Rad am to ore Stock et of 30 Rome Buston (I.a. actives and to a to a to at sen free! Write: Cast Indignates, Los Angeles 61 Calls. Dept A-E

9"I Made $^{5}14,839$ in 1 Year SERVICING RADIATORS



INLAND MFG. CO., Dept. PS. S. 1100 Jackson St., Omoho 2, Hebr.

Starter Kits from 199"

AUTO-CRAFT, me

America's Newest Junior Sports Thrill!

1/4 and 1/2 MIDGET RACERS

and advertised core

For both a 4 to 4 to specificate with the specific terms of a more whether specific turns with the regions of anyther plants and the same of the Salver of the 1981 of the Company delicks thing proved book participate she of beauth the discourse from their delivery see all corn-countries words on 1750 at

> Box 231 a 1301 East 4th Mr. HUTCHINSON, KANSAS

STUDY TO BE A DOCTOR of Psychology or Metaphysics

Obtain & Ps.D., Ms D., or Ph D. Be a Teacher, Lecturar or Accredited Practitioner. Teach others how to achieve Health Happiness and Contentment. Chartered by State. Correspondence courses only. Write for PREE book telling how.

THE NEOTARIAN FELLOWSHIP

Desk 5. Pickwick Building

Kazone City 5, Missourt

GOVERNMENT OIL LEASES

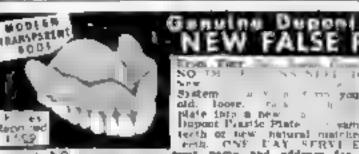
You do no drilling, pay no taxes, may realize a king-size profit without ever leaving home. Write for free map and literature.

AMERICAN OIL SCOUTS, Dept. PS

7321 Beverly Blvd

Los Angeles 36, Colif

TOWN



terth or low haters matched ents. CVF PAY SERVI E your name and address for at att low price. Highest prices

poid for Pental FREE: 6 months' supply Folse Plate Cleaner to

ALL STATE DENTAL LABORATORIES

22 W. Madison

FREE, details.

Papt. 255

Chicago 2

YAG OC

MONSY

THIAL

limited



Makes \$216 A MONTH



"I average up to \$216.00 A Month.. operating my Belsow Sharp-All after smelt intel on Sameria of

M. REARICK SAYS:

Turn spare time into Big Cash Profits with new Beisew Sharp Ail No experience needed to sharpen knives, scissors, shears, ice skates, mower blades, hedge trimmers, axes, chisels and circular saws . . . Learn how easily you can start your own spare time business. Amazing low cost easy-payment plan, Send Postcard for FREE BOOK. BELSAW SHARP-ALL CO 700 Field Bldg., Kansas City 11, Mo.

WRITE for FREE CATALOG with 14 UNSALMED LAND

Thousands of Customers



QUALITY READING-MAGNIFTING DA BIFOCAL GLASSES FOR FAR AND NEAR ADVANCE SPECTACLE COMPANY, Inc. 537 S. Deurborn St., Bopt. SP-SEChicago S. Hilmois

GET INTO RADIO - TELEVISIO

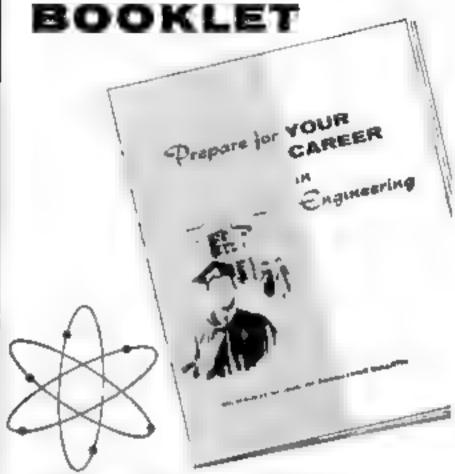
Prepare for Big Pay Jobs or Your Own Business TRAIN AT HOME IN SPARE TIME! Earn While You Learn

Good pay jobs are waiting for men who know RADIO-TELEVISION, Learn at home, get valuable, interesting, actual, practical experiches with kits and equipment we send. Earn extra cash servicing sets while learning. No previous experience needed. Hush coupon for hig book and Sample Lemon . . . FREE! No salesman will call. Our 27th year.

Catalog and Samula Lessen

Spreyborry Academy of Radio-Yelevision 1812 Jarvin Ave., Bept. 55-8, Chicago 26, III, Rush catalog and complete lesson . no obligation. NAME------

Interesting, Pictorial FREE



to help you decide on

VOUR CAREER IN ENGINEERING

Here is a graphic story about dynamic careers as engineers and engineering technicians. Booklet covers such subjects as:

- Wide variety of job opportunities.
- The courses offered, degrees you can earn, and what you are qualified to do.
- Pictures of the Milwaukee School of Engineering, its facilities, plus Milwaukee scenes.
- Recreation, student organizations, fraternities.
- Scholarships, part-time work, admission requirements.

-and many other important and interesting facts to help you understand and decide on your career in engineering. Send for your free copy today - no obligation whatsoever.

Milwaukee School of Engineering dedicated to serving young men and industry

EEMD COUPON

	ee School of Engineering
Dept. PS-558,	1025 N. Milwaukee St., Milwaukee, Wis.
	ine free the new booklet "Prepare for in Engineering, I'm interested in (course)
Verne	Ap=
Address	
City	Zone State
_	Die for veteran's education benefits.



FREE BOOK

Write today for a PHEE copy of illustrated law book, "THE LAW-TRAINED MAN." which shows how to earn the professional Barbeloy of Laws (LL B) degree through home study of the famous Blackstone Law Course, All pecusiary books and leasons provided. Mederate cost, convenient monthly terms. Write for FREE Law training book today.

Blackstone School of Law, 307 N. Michigan Ave. Dept. 125. Chicago 1. Illinois Founded 1890

Broad Markets Await Brikcrete Manufacturers

Because Brikerete gives so much for so little it is the preferred masonry for homes, schools, motess-practi-

cally every kind of residential, commercial, and industrial construction. A lower-than-lumber selling price still permits 100% or more mark-up on basic production costs. And Brikerete has quality appeal because it is outstanding in design, proportion and color. All the values that building owners and contractors are looking for. That's why market potentials are so broad.

More Local Plants Needed

As a local manufacturing opportunity, Brikerote has much to offer Local markets are supplied by local plants using local meterials and labor. Savings in freight and distribution anable low selling prices, high income potentials. Plants operate is franchise-protected territories with exclusive privileges. And for men of modest capital, machinery is available on easy-topay lease arrangements. Write or wire for Brikgrete Book No. 2.

Brikerote Associates, Inc., 422 W. 25th, Holland, Mich.



Carn more from the start white tearning AT HOME. So, up our own profitable business at home enjoy strady prome nide production in the booming field of Custom Furniture Campaters.

Hight off you start with tools complete fraints thirds may right he inted FRFE with your SY State approach UTS course You can be you fearn at lied postessional custom of hostery results story food three his boy reports to make all powers window corpices custions draner end to muce there is no little food. Sample Lesson for ready for well part took. Sample Lesson for cearly for the course of the cearly work.

Dept. DE-1610, 721 B'way, N. Y. S. N. Y.

NORELCO "Speedshaver" Men's Electric Shaver Latest model, brand new and fully guaranteed Complete with case, card and cleaning brush Regularly relaits of \$24.95. Our price \$13.95 plus 70 cents molling costs or \$14.65 total. All orders filled within 24 his Your money back if you are not fully satisfind Send check or M. O. for \$14.65 to

JOHN BROOKS, Dant 138, Ben 212, St. Louis 3, Mo.



OTTOWNS

P1 U3

SLIP COVERS

LEARN AT HOME -

CHT BEMS Piffes FOR FUN - FOR PROFIT! Start today . . . get sequalisted with the most theilling hebby ever downed APIDARY Learn to make expert, erefuse onal-type rings, brage less, jewelry in your own hems.

ASNO for our PRES LS page bookies delail data from the values a leading auguliers to the trade. NO DELIGATION write teday to: GRIEGER'S, the Dept. 261, 1833 East Walnut, Passadona 6, Galifornia,

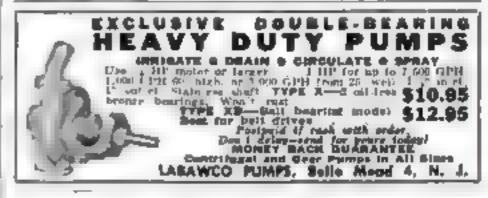


OSBORN MASTER WHEELS

12" X 3.50---%" BALL BEARING, CADMIUM PLATED, HEAVY STEEL WHEEL WITH 200 LB. LOAD SEMI-PNIUMATIC TIRE

DARY \$5.00 each F O.S. 25% deposit with C.O.D. orders. Send for Literature

Claverlant Freeland Corporation Osborn Div. 1, Hosleton, Fenna.



When Writing to Advertisers Please Mention Popular Science

Catalog or 3200 Novelties 10c

Send 10t for Amazing entalog of nevelties, tive animals, screen lie supplies hubbles, funmature planes & beats, looms, may a tricks, joke articles, unusus seeds gadnunna teach cet timesevers, cameras, optical goods, are ecture, movies, acky jowelry, re iglous novelies, disquites, movies, acky jowelry, re iglous novelies, disquites, musical instruments, stamps, coins, puzzles, fortune in iers, vadios, auto & b ke accessories telescopes, magnifiers, compasses, bunks, amovers' gadgets, artists' supplies, printing sets, engines, motors, shockers, kn ves, billfolds, firstwarks, guns, rifles, sports, books, games, plants, vic. teng games, address & 10c to: JOHNSON SMITH & CO., Dept. 445

MAGIC MAIL PLAN

that comes with this Little Machine CAN MAKE YOU *5™ AN HOUR



Write today for free facts about the newest and most fascinating of all new home operated businesses. For the first time, a simplified machine brings the fabulous profits of Flastic Sealing and Plastic Laminating within reach of the small operator Anyone can learn to operate it with a faw mingter practice. Then—with our MAGIC MAIL PLAN—can get mail orders pouring in daily with cash in every envelope.

No Canvassing or Selling

Fill orders at home in spare time to start. Then expand to full time busibess. We even supply circulars to bring back cash and orders. Rush name for all the facts you need to start. A postenry will do. No charge,

WARNER ELECTRIC CO., Book L-3 E 1512 Jarvio, Chicago 26, Illinaio

Troubled With GETTING UP NIGHTS

Pains in Back, Hips, Legs, Tiredness Then your troubles may be traced to Glandular Dysfunction . . a constitutional discase. Neglect of this condition often leads

to premature old age and sometimes incurable malignancy The Excelsion Medical Clinic has a New Free Book that tells how thousands of men have been successfully treated here at Excelsior Springs for Glaudular Dysfunction by NON-BURGICAL Methods. They found soothing relief and a new outlook in the future of life. This Free Book may prove of utmost importance in your life. Write Today, There is no obligation.

Excelsion Medical Clinic Dept. 8219, Excelsion Spgs., Me.



TELESCOPES

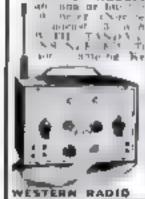
Refractors-Reflectors Complete-Ready for use-With or without Tripads

\$3.98 to \$475 up

Sand for free illustrated booklet CPS2 CRITERION MANUFACTURING CO. 337 Church St., Hartford 1, Conn.

444

1 4 BIN



of 3 is define the first of the THE TANGET Take HE with your eyes.

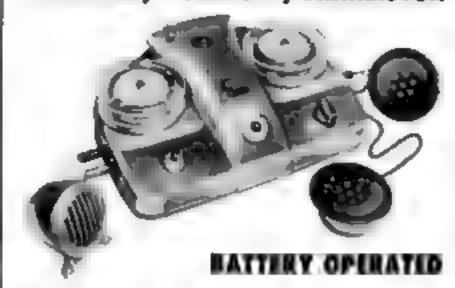
So he has Take He with your eyes.

Some our Keeps to contact with history control of the Land of the land. PORTS IN HIS TO RETE t sens he are a W to a frame he to a War and page of the Court Al may 1 (E)

the moved of the

off a product

Never Before Available at this LOW PRICE! PRECISION, PORTABLE, TRANSISTOR



TAPE RECORDER

Hi-Quality Reproduction! Weighs only 2 lbs./

PRECISION ENGINEERED—This amazing new, bottery-operated, portable, fully fransisterized plac \$1.50 lope recorder, imported from West Germony, pp & Hills. is precision engineered to render the same functions as muchines coaling five times as much.

FOR HOME, STUDENTS, EUSINESS—it will be the center of affraction at home far recording family get-togethers. capturing the magic of speech and song of family and friends-records radio, record and TV showel Educators, too, agree that students, thru college level, benefit greatly from studying with a tape recorder Business men can pack it in brief case or bog and take it along on trips to record letters, speeches, instructions, ideas, faithfully records verbal agreements, discussions. Perfect for recording interviews

PERMIES TO OPERATE—The Ingenious Tel Tope records, plays back and erases—even has variable speed controls! Operates on 4 ordinary C-batter ex available at any store for pennies, A simple press of a button and you're ready to record, It's so simple, even a child of five con operate it!

WHICHOITIGHALLY GUARANTEED-A wanderful geft for allfor home, school or business

Comes complete with sensitive microphone, head-set and tope-\$29 95 plus \$1.50 pg. & hdlg

AVAILABLE ACCESSORIES

PATCHCORD-Plug in enachment for playback thru STEINO HEAD-SET-Like a doctor's stethoscopu. Lightweight. Leaves hands free for lyping, atc \$6.95 REEL OF TAPE (225 H.) \$1 25 BATTERIES-Set of 4.

Unconditionally Coursessed for 10 days against surchanical defects.

FILHOR PRODUCTS, INC. 101 W. 31 8L. New York 1, N. Y.

FILNOR PRODUCTS INC. Dept. M-36 (0) West 31 St. New York I, N Y. I enclose 5 (check or money arder) for the Items that I have checked below Please sand at ence under the condi- tions of your warranty.
CORDER. Microphone, Hend Set, Magnetic Recording Tape, Bears Reel and SEEM Instruction Booklet. 529.95 also \$1.50 postage and handling. Please Print To Avoid Errors And Delay
Name
Address., , , , , , , , , , , , , , , , , , ,
City Zone State
Gend C.O.D. Enclosed is \$3.00 deposit, [will pay post- man 5 plus at C.O.D. and shipping charges for the Rome ordered.

SAVE 1/2 OR MORE

Build this six transistor

No other portable ves you o many parers 3 5-(4 1 0 W P + 4" + 6" something and the confi he barroly re you 0 10 0 0 0 1 (10 nm' p s h h quanty, as trace, ----C100-11

portable radio

IT'S EASY, FUN. EDUCATIONAL

No apacia, look or skills required Clearly Mustrated step-by-step instructions guarantee your success—and you learn about electronics the easy way--BY DO NG!

SEND FOR FREE CATALOG

.... Describing nearly 100 other "doit yourself" HEATHKITS for hobby. h. fi, ham radio or professional.

"do-A-yourself" electronics

COMPANY BENTON HARBOR 18, MICH.

aldlary of Daystram, Inc.

name address -



YOUR OWN BRAND NAME, your address, on every can of this easy-to-use, quickaction car polish. It has to be bought through you—all repeat sales—all recommended sales—are yours for a handsame profit.

TOP QUALITY-mode by a firm with 54 years' reputation. Demonstration sells. It's a sure repeat item whose fame spreads. Small investment-quick turnover-sure succass. You're the bass of a five, expanding

You choose from a selection of attentiongetting package designs. Exclusive terrifory available. Write for sales details and free sample. For full-pint demonstrator, send \$1.00.

C. P. Baker & Co., Dept. 4-A 501 N. 11th St., Philadelphia 23, Pa.



ARITHMETIC CAN USE THIS STANDARD SLIDE HULE!

Be modern-use this quick easy way of Eguring For husiness mes. students, carpetters much nats, spicimen, printers and engravers office workers (asmera merchants thus keepers, planthers shortelcians-exercising who does diguring can save time and labor with Lbis side rule

Historical Instruction book above you have to not correct anaecra instantly without penell and paper (You get 1919); also care and instruction book for only 224 pastpool. Satisfaction government of refund,

Co., 216 S. Clinton, Dept. 2ES-1, Chicago &

Va" Drill Attachment

IN MINUTES

"Sharpee", the new rotary brade sharpener lits any "4" electric drill and sharpens all ratory mower blades -knives, azes, koes, etc. Guide mg n-

tolks correct engls. Long wear grinder \$2,98 ppd. Cosh or C O D Satisfact on guaranteed Order Taday MOWER-MATE TOOL CO., RIVERTON, KANSAS

Dea er Inquiren invoted

100

ELIMINATE ENGINE SLUDGE

All gasts ine engines make a gallon of water for every ga ten of gas they burn Some of his spontine gots in the oil forming as its and studge that game up hitters we we and rings Only we hat a preventation of PRAM glocuic blower circulates distred als the FRAM electric blower circulates thiered all throughout the cratterase carrying of this mais are

Specify year and make of cut. Order now or write for the hot placemen on. Meney back guarantee.

HAA DISTRIBUTING COMPANY 3411 N.E. 5244 Ave. Portland 20, Ore-Dealer Inquiries Invited

Dectors' amazing discovery may help you prevent ing of the arterios and dangerous heart attacks. Send no money Just write your name and address on a posteard for FREE information. Prompt action may lengthen your life. Write:--

U. S. HEALTH CLUB,

d, N. J.

AUTOMATIC -22 CAL

• Na Permit Required . Fully Automatic So I ejers pg eq p. billing gering miljusta.

Lee's of muste to the Hiped Wen Learn

man, the Winderful for sporting even a

lie. I berformanies. I was

miljushers, etc. 4" long perfectly by an

of on a money burk guaranter Scott to Dept. 6-54, 403 Market St. Mewark, M.J. to Cast. Residence.

AS LOW AS

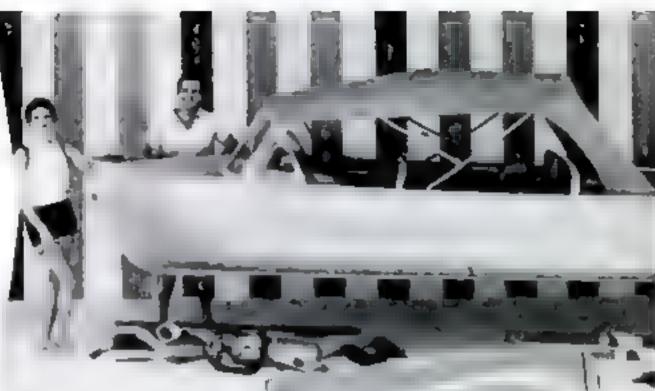
Settle us your old to done chalker in on the constitution of the them not now up no cold words upon to place places 50 AMPRESSIONS needed with our rest of may nothed. We use your own old plates. We remake them the present those visit ours. Mostors to struct a present of ma bel and respect We by ARANTLE TO SATISFY YOU OR REFUND YOUR MONEY

SEND NO MONEY Send us your name today and well BUSH COMPLETE DETAILS there to enjoy life right now. Cap this

CHICAGO DENTAL PLATE LABORATORY . Bopt. 255-55 38 N. Beerborn St. + Suite 714 + Chicage 2, III.

NEWEST

CATALOG NOW READY



 Send for this complete presentation of the newest in boats, runabouts and canoes. Shows 26 models, including 2 new Aluma Glass runabouts, in full color exactly as you would see them at the big boat shows. See new styles, new ideas, new sizes with a range of prices to fit every pocketbook. Now ready. Write for your free copy.



Our design and construction have set many new booting industry standards for style, performance, safety and strength. Along Craft require practically no uphose. Write for catalog.

ALUMA CRAFT BOAT COMPANY . 1521 Central Ave. N.E., Minneapolis 13, Minn.



Special Offer 2 0kg 51 00 2 8kg 51 50 or all 5 for \$2 00 From Junked Refrigerators for a Few Dollars NETHUCTION BOOKS SHOW YOU HOW 75c EACH HOW TO BUILD a Low Cost Air Conditioner'
HOW TO BUILD a Low Cost Home Freezer
HOW TO BUILD a Low Cost Dengmidding'
HOW TO BUILD a Low Cost Dengmidding'
HOW TO BUILD a Low Cost Dengmidding' \$119 00 md up

Roo Engineering Co. Dept F 5, 1320 M. Clybourn, Ch cago 10, fel. in seconds! Works

> The super-penetrating rust solvent that quickly loosens rust and corresion. AT NARDWARE STORES, GARAGES SERVICE STATIONS, EVERYWHERE RADIATOR SPECIALTY CO.

Charlette, N. C.

goals. MAIL COUPON NOW

or full information

Check

SCHOOL.

and increased

tion CYN

you might otherw work you like best

chaose the

Вожи Арония Without a bout





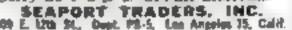
WATCH OF A

Contains everything you've always wanted in a rugged he man watch plus the luxury appearance of a watch costing \$100 & MORE This handsome Swiss Watch features famous Phina main apping that insures absolute timing accuracy Anti-magnetic Has large easy-to-read modern dial encased in a sparking 14 carat gold-plated case Back is chrome plated to prevent your wrist from over turning dark or becoming irritated. Deluga 14 c gold-pinted expansion band has attainless steel backing & is inlayed with simulated alligator leather Makes terrific gift. Only \$7.90 complete We pay postage Specify whether you want brown or black alligator leather in band Send cash check or MO Caff res add 4 state tax. Sorry to COD a OFFER LIMITED.

SEAPORT TRADERS, INC.

SEAPORT TRADERS, INC.

SEAPORT TRADERS, INC. plus the luxury appearance of a watch costing \$100 & MORE This hand-





WORLD PUMPS

Finest Quality Highest Performance Bronze Impeliar—GE Motor, Bta niess shoft—Ceramic shaft seal. 1 HP 41 GPM @ 31 Lb \$69 85— 1½ HP 61 GPM @ 32 Lb \$86 95 FOB. For 115 or 230 voits A.C. Built in Thermal Overload Protec-

World Sales—Box 885—Olus, Fla. \$20.00 deposit on C.O.D.'s



JAMES MONROE

Fifth President of the United States last fust been honored with a most musual new Com-morative stamp. Let us send you a beautiful engraved envelope bearing this stamp and posted on its first is of more together with a FREE UR, Freshtent stamp of Monaco PLOS a Orace Kelly Wesleing stamp all for only \$54. Or order 5 at different 1 8, First Day Convex for just 11 31 seep back if not completely satisfied. Ask for Bala of other coron.

K. M. WALSH BOX 302 TUCKAHOE, N. Y.

On sale now!

ONLY \$1.00

POPULAR SCIENCE MONTHLY'S NEW BOOK

"How to Make Your Own **BUILT-INS AND** SPACE SAVERS"

By Bill Baker

Transform unused space in your home into compact, modern living areas. This fully illustrated Popular Science book of original designs will show you how, 160 extra large pages, 560 step-by-step photos, easy-to-follow instructions for low-cost luxury kitchen; hideaway bar; TV-Hi-Fi unit. woman's dream sewing center; one-wall complete workshop and ten more complete space-saving projects. Clear, detailed diagrams and large-scale drawings make every step simple. Much more!

Get Your Copy TODAY! Only \$1.00 of Newsdeolers. Or send \$1.00 to Popular Science, Dept. 558, 353 Fourth Ave., New York 10, N. Y.



York of one of the lawns sarrounding the over \$ 2500 800 home of The stope of the lawest as resulted from the stop on the read that beach of the Golf of Mexico, the run over a page and thoughts and neutral proposis are planted solidity to Mondo Cons." Iroly one of the most affiretive show places of the Bouth

NOW IS GOOD TIME TO PLANT OR

CAN BE PLANTED SPRING-SUMMER-FALL-WINTER (If ground is not frozen)

IILUE-GREEN

REQUIRES NO MOWING -GREATLY BEAUTIFIES LAWN

Buy the ONLY genuine Mondo "Grass" from us. Seware of imitations.

Bus-Green Mondo "Gesse" is described by the U.S. Department of Agriculture as Ophiopoden Japonicus (formerly called Mondo Japonicus) is not ve to Northern China and should Withstand severe decree of freezing eventrees, commun.y caded Manilo Grane

This soil forming EVER/IREEN invegraving oriental genus to currently used by many owners of distinctive homes in America for sawn grass. Now we can offer this exclusive these Green Mondo "Grass" at popular prices.

Green Mondo "Green" retains its coince the year country to the brown off in the extreme northern L N , he was in state or but matterney hardy rarray requires watering fanta-clearly beautiful, drooping for to the ground its weeping signs year after year like QUIRER NO MOWING

Ideal for heavy shaded areas or our dry or wet PREE folder of feetimentate and many photos of Mondo sawds sent on request Mondo is resistant to daya-re leverts and animals will may feed on it Stars emission glows o apartity of their our ther Erass and woods multiplies rapidly approximately lift times. It take t, first pear II to the plant of the property value for approximations we passed to revultimate to many making For good coverage first year plant 2" to de apart. Numberous restell is piles

Planting and culture instructions with each order Remittance with order Shipped around MONEY MACK Of ARANTEES If not entupletely de lighted you may return at once for returns Open account to A I cared firms but up I dust spring or more. FOR Bl on

ORDER TODAY

Sories shipped in damp sepes. Quaranteed to grow it we will

25 Sprigs	5 2.98
50 Sprigs	5.00
100 Sprigs	9.00
500 Sprige	40.00
1,000 Sprigs	79.00
6,000 Series or more per 1,000	50.00

MONDO GRASS CO., Dept. PS-5, Biloxi, Miss.

Le live # Mirris Citara	for Prepaid Shipmont	. Mpi	=1111
Name	MANANA pa		
Address			
i sty.	. a many Stre man	-1-	

PREPARE FOR THE



\$2.95 OR 2 FOR \$5.00

TESTER ASSISTEMANTEES

Write for free list on all types of telephones. Shipments F.O.B. Simpson, Pa.

TELEPHONE ENGINEERING CO.

Dopt. SAS

Simpson, Pa.

Chicago &, Ulinois MORE JOBS THAN GRADUATES

auto mechanics

AIR CONSITIONING & Petrigorobian

MACHINIST—Yeal & Die

TOOL & DIE MAKING

· Matter Machinist

Seen after marting many Al-LIED students begin to make good extra money in the copure time Your Home Training may not be you to two weeks of training at the great Ald IED abopt at he additional infriences, about on desire it Students pluoping a currently engineering to engineering in short convers at

1232-42 South Michigan Ave., Deat. PS.ES. Chicago S. III.

read bowle their fraince in students placetor is stand bowle their fraince in short consume of Frame or at Atland Santings and continue pro-gressively toward an engineering degree in 33 months, ALLIET is approved by adducty bis though Home Study Council Dent of Estimation Office of Public Instruction, Stale of Illinois

in your sport time

Affied Institute of Technology, Div.,

ALLIED INSTITUTE or of



I'll Send	You This	Handsome
SAMPL	E CAS	E-FREE



and Show You How to Make Up to \$30.00 in a Day

Whith for this FREE Tonorium the mole Chargeaches with 100 benutiful, big-value pair and overcunt fateries Take artises from triangle, for the quality, made to-measure riother. Pocket hig cost profits in advance.

FOREST BY CASE PROOF STREETS - CHICAGO 7, ILLINDIA

DWAFTING—All B O Mechanical D Structural Or O Model Structural	ranches AU rafting AII	TO MECHANICS CONDITIONING Afrigoration CHINIST Tool & Dir Makier Machinist Tool & Dir Making
WAME		
A0002553		
CITY	COUNTY	- STATE

A chance to win...

\$125,000

...in cash prizes



All you have to do is obtain an official entry blank from any building material or hardware dealer who displays the official Home Improvement Council emblem.

Read the rules carefully—fill the blank out and send it to the Home Improvement Council . . . P.O. Box 810 . . . Chicago 77, Ill.

Act quickly—very little time is left for you to enter the contest. If you cannot obtain an official entry blank, write to POPULAR

SCIENCE MONTHLY—353 Fourth Avenue, New York City 10, New York. We will see that you receive a contest entry blank.

Read every issue of POPULAR SCIENCE for hints on how-to save time and do a better job on your home modernization projects.



Shrinks Hemorrhoids New Way Without Surgery

Science Finds Healing Substance That Relieves Pain—Shrinks Hemorrhoids

For the first time science has found a new healing substance with the astoniahing ability to shrink hemorrhoids and to relieve pain—without surgery

In case after case, while gently relieving pain, actual reduction (shrinkage) took place.

Most amazing of all—results were so thorough that sufferers made astonishing statements like "Piles have ceased to be a problem"

The secret is a new healing substance (Bio-Dyne*)
—d.scovery of a world-famous research institute.

This substance is now available in suppository or contract form under the name Preparation H.* Ask for it at all drug counters—money back guarantee.

*Beg. U.S. Pas. Off.

58 E So. Raymond



ENGINEERING TECHNICIAN

ELECTRONICS ... RADIO-TVI
A B. Degree in just 24 months at resident school; or romplete first year by home study. Also radio TV servicing broadcasting, siring training. Nation-wide place-Ranidont. ment service. G. I. approved. Low tuition. Name Study. Write NOW for FREE illustrated entalog.

CENTRAL TECHNICAL PHISTITUTE (Est. 1931) Dopt. T-56, 1644 Wyandette Street, Rannes City 8, Mitsouri



CUTTER-CRAFT



YOUR OWN POCKET SIZE RADIO STATIONS
of GAPS ASTS TO ANY ROME OR CAR RAILD WITHERT
WHEES OR HODKUPS! WE only 5 on the (hyaziyatas' Boat
the second of temper sector of take to under section on the flame
for works on helf-contained make the traderies. Pombia plastic man, With this Radio Talkie you CAN
TALK TO YOUR PRIENDS UP TO A SLAYN ON
WORK AWAII Talk up to 1 miles of those between
two astronobles INSTANT OPERATION: Just
by the astronobles INSTANT OPERATION: Just
with hortoo to talk! No lietuse needed Uses to
doctive field amagnetic redistion thefol and red
(un is a mi im ways! CIARANTEED TO
WORK I YEAR SERVICE CLARANTEED TO
SEND ONLY S3.00. Icash, the mo, and my
postmus \$1.95 COD postage or send \$12.90 for pre
paid delivery COMPLETT READY TO (PERATE
with instructions and bandeeds of ways and Iricks
for brundessts thru may radio you desire Price may
to up soon, 1-5 set your NEW POWERENT, RADIODOOR RES S HEARNEY NEBRI

HOME REPAIR TIP NO. 45



Mend and decorate plastic inflatable toys with colorful "Scoren" Plastic Tape. Stretchy, all-plastic tape sticks like skin, resists scuffing, won't crack or split. Guaranteed waterproof and airtight! Get it in white, red, yellow, green, brown, blue, black or new clear plastic that blends with any color! In 3/4" width—25¢, 11/2" width—50¢ at stores everywhere.

Don't run short . . .
NEXT TIME BUY TWO!

Made by Minnesota Mining & Mfg. Co. St. Paul 6, Minn. © 3M Co., 1958



MINIATURE MACHINE SHOP

No digger Them A Typewriter, Octporterms Mackines Many Times its Size!"
That a what Mechanix ideastrated says about UNIMAT in their 8 page feature story in the May lance. If you want a reprint of the story prus cur piete information about this amazing 10 in 1 corchization precision tool write to:

AMERICAN EDELSTAAL, INC., UNIMAT DIV. Oapt, 158-350 E'way., N. Y. 13



WE CAN HELP YOU QUALIFY. America's gigantic highway building program alone needs thousands of trained Diesel, Tractor and Heavy Equipment operators and mechanics. Are you interested in a steady, high pay Diesel job? We can help you qualify

COMPLETE DIESEL COURSE NOW AVAILABLE, if you are ambitious and want to get ahead in this big money field, you'll want to know about the complete Diesel home training course now offered by Interstate Training Service Covers all phases of operation, repair, service. Easy to master in spare time. No interference with present job. Up-to-the-minute. Regularly revised to cover new developments. We myste comparison of material offered. Advisory placement service for our students.



YOU OWE IT TO YOURSELF to investigate interstate Training Service Direct Training Thousands agree it has belied them to better jobs a better pay. It can do the same for you!

WRITE FOR FREE INFORMATION TODAY

,	INTERSTATE TRAINING SERVICE, Portland 13, Ore.
	Pierse and that I race on MET 24-page book. (A-S)
	'Getting Ahead In Diesel."

NAME		A0E
ADDRESS.		
CITY	IONE	STATE



PAY I on the DOLLAR or 1000's of Useful Items

AT THESE LOW PRICES PAID AT RECENT GOV'T SALES

Jeeps . . . \$223 | Tractors . Frucks . . \$212 Motors Boats . . \$5.90 Arresnes Fork-lifts, \$197 | Typewriters, \$6 80 Hydraulic cylinders \$1 DI . Gear Reducers 97c • Transmissions \$7.80

Eleminate the middleman-Save big money! Buy direct from U. TREMENDOUS savings. Pay as low as 1c on the dollar or less. Our Directory Govt Surplus Sales lists 100's of Army, Navy, Air Force, and other government surplus deputs Many of them right in your own back yard. Buy sports equipment, hunting, fishing and photographic equipment and supplies, radio, electronic and electrical equipment, trucks. boals, jeeps, amplanes. Plumbing, hardware, office equipment supplies. Power tools machinery, furniture. Directory is indexed for quick information, Answers your questions. Tells you how to buy. Get on the grary train while you can. Send \$1 for "Gost. Surplus Directory" to-Aviation Surplus Center, Dept. PS-5, Etters, Pa.

Mr. at a

er gatie tra * FQ ar 103 P track assembnes final drive assembites, steerection ayatems. ling systems idlers rollers, power transfer systems; cable con-trol systems hydraulic control cylinders & welding pertaining to heavy equipment such as buildozers, scrapers, loaders, off-highway trucks etc Course time—540 hours—14 weeks— Convenient payment plan. Write for detain

Phones would F D S. Information on the Hands Tay

NAME

AGE

ADDRESS CITY

..... ... PHONE......

STATE

Att. P E. Hutch Bon 278, Bratchwood, 611.

EXACT SKELETON MODEL ONE FOOT HIGH

AMAZING ANATOMICAL REPRODUCTION

- 1/6 scole of 6 ft, man
- Fully articulated, working model
- Accurate detail, contour, bane color
- 4 year work, \$20,000 production tooling
- A triumph of model making opplayded by doctors & teachers
- Instructive, fescinating to awn or givemagnificant conversation piecs

NOW \$ 195

•

Developed after years of work, this precise human skeleton model in fine for doctors, nurses, students etc.; perfect fun

for office, den, desk or club. (And what a gag ! "ideal" business partner; eye-catching store display, car ornament.) Parts interlock, anap together, With identification chart, \$2.95. With stand, \$3.95 ppd. (Obviously a must for everyone's closet). Money back guarantee.

CHABON SCIENTIFIC CO. ROOM 411-A, 40 EAST 42nd STREET, NEW YORK 17



FIND it...with a GOLBAK Treasure Finder, Send for FREE Istorature on complate line of mineral & metal locators, underwater detectors, etc., priced as

low as \$64.50. in calebration of its 25th year, GOLDAK CO. Introduces new translator instruments for greater sensitivity — less weight - low cost flashlight batteries, Write for information today!

SENDALE, CALIF. GOLDAK CO.

BOVERNMENT 40 ACRE

Act of Congress gives citizens equal rights with Oil Co's, to obtain Govt. leases, You do no drilling, yet may share in fortunes made from all on public lands. (Payments if desired) Licensed & Bonded Oil Brokers. Free Information & Maps of booming areas. Write:

> NORTH AMERICAN OIL SURVEYS 9273-AM Support Bird., Les Angules 46, Calif.

STOP RUPTURE SUFFERING! GUARANTEES LASTING RELIEF -OR YOUR MONEY BACK!



œ.

ĸ.

Thousands have overcome disabling ruptures with the natural support of Web's patented design. Satisfaction—or full price refunded. Write for free book

WEB TRUSS CO., Dept. PS-5, HAGERSTOWN, ML.

SIGN PAINTING

Hame-Study Course-Only 55 95



Train a no exercise relay sight for ming and sight a not done as it is seemed over Tot. At in leading shops all over the ententry upper to provide the feet are the sight sight as latest methods of track lettering offer doors went etters, reflecting hims appeared a goal staff with account process, the doors went etters, reflecting hims appeared a goal staff with account process, the fact graphs is most making one on a information, etc.

Lating Action Commandate the surface of the instructh of a big is part of various numbered course. Full price only \$5 th pursues of the staff of the course with a single course. MELSON-HALL CO., 218 S. Clinton St., Dopt. ES-1, Chicago 6, Ill.

OVER 1/2 ON WATER SKIS \$16 95 SCHADOW WIT \$12.50

Assemble and finish this full size set of Outboard Skis and save over one half, Size 6' x 70" x 9/16" solid ash, laminated tip, Adjustable bindings to fit any foot. Slalom kit complete with extra toe piece and alum. fin, parts and instructions included. Send check or M.O. to

MECO, Box 4076, Columbia 4, S. C., C O D. Orders Accepted

MODEL 400 SIMPLEX LAWNMOWER SHARPENER

Offers These Big Advantages:

- Grinds All Types of Mowers
- Ke Dis-assembly Readed
- · Feeds Kertzentelly-Verticulty
- Head Torms 70° for Bed Knives
- Fast, Positive Adjustment

refutits big profits! Bugged-duty Construction Send For Free Brochure Today



The Fate-Root-Heath Company - Dept. PS-5 - Plymouth, Onlo

Smoll Investment

\$1,000 A MONTH? That's what Stanfey Hymen made selling the america new Prests Fire Extinguisher! Many others cleaning up -se can you! Amazing tiny new extinguisher ends fires fast as 2 seconds Querenteed for 20 yearst Sells for only \$4 95. Write for Free sales kit.

Marito Industries, Inc., Preste Div., 114 E. 32nd St., Dept. P-16J, New York 16, St. Y.

1,000,0001111 ENSES

A. JAEGERS

4918 MERRICK RD.

LYNSROOK, N. Y.



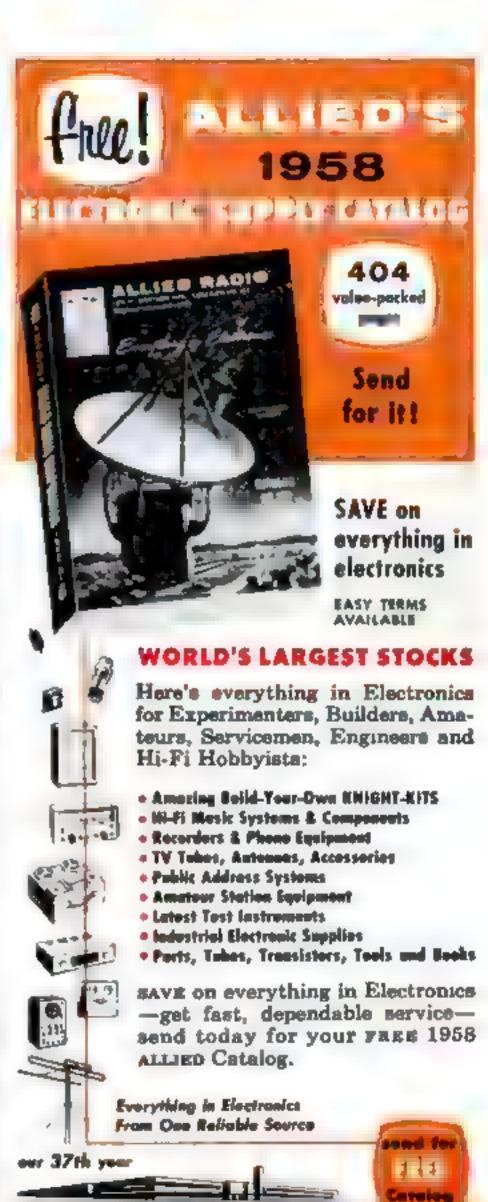
BOAT KIT **50 Medets** A' to 18'



LUGER INDUSTRIES, INC. 9200 Access Rd.

Big Catalog in Full Color vertibles, Sahing 341.75 and up, Freight pd. Luger boots equal factory built; yet save you to \$3 cost Methods assure a perfect assembly by unyone. Send 25¢ today for big color cotalog Including Fiberglas, paints, hardwore, accessories.

Dept. A-5 Minnespolis 20, Minn.



ALLIED

Name.

City.

Address_

AULIED RADIO CORP., Dept. 7-ES 100 N. Western Ave., Chicago 80, Ill.

Rush FREE 1958 ALLIED 404-Page Catalog

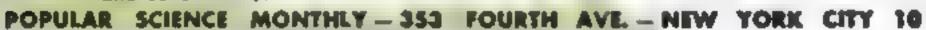
Zone ___

State_

CLASSIFIED OPPORTUNITIES

Here are hundreds of appartunities offered especially to the readers of Popular Science Monthly. Read them. Answer them! You can make

and save meney.



Classified Ada only \$1.10 per word insertion, payable in advance. Minimum ad 10 words. To be included in July Issue, capy should be in our office by May 22. No concellations accepted after May 13. Address orders to O. E. Relly, Classified Adv. Mgr.

AUTOMOBILES & MIDGET CARN

BOYS Power Driven Auto Build your awn New 1956 p.min parts list 35 cents. Bupher Co Sin F Tuesdo Obto

1850 CARS-Trucks New All Maket-Bave Hundreds Pl Groton Cartisad N Y

CROSLEY And Poreign Car Owners Cat-alugues Avanable Parts Discount. Box 1, Elmont New York

BUILD Sharp I Seater Midget Car al Rome Place \$1.00 Sherman 701 M. Mirabda, Las Cruces New Mexico

NON profit organization offers sulomo-bile distrature—old modern and fore en-denser books, service manuals guary photographs free motor maga it is Write to get on free may dat. Auto Maniaca, Blockbridge, Mit lagutt

OLD copies of Pondiar Science wanted. any issue from period 1400 to . 0.5 Condition not too important privided books are complete with he pages removed Write to Box No 306, Tuckanor, New York.

AUTO SUPPLIES & PHUIPMENT

BAVE money on Jeep and army truck parts Large inventors Causings for Jeep and O M C on sers American Auto Pa is Co 1830 P8 Lacust, Kanass City Misaouri.

PREE' 1958 Automotive Cotaing 200 pages -75 000 listus Paris of every description for etack cars hot rods custom tata trucks and stal in augusta Save up to 50. Same day service Quantly guar anteed or money back Sand 25s. crefs id able. Bret order J. C. Whitney 1818 PS 5 Archer Chicago 16, Ill.

LATE model owners. Play safe, install reliable gauges Ammeter \$1.00 CHI Prog-sure \$2.20 postpaid Money back guaran-tee Sullivan's, 1942 Rhode Island Ave. Aleblupa Penna

DOLDEN Initials for your car doors neat easy to apply—asst indefinitely! Two sets only \$1.00 J.K. Enterprises, Box 120.1 New Orienns 24 Louisians.

SENSATIONAL New Car O Siceper No More Motel Bills. Write Buldwin Enterprises Box 731, Chillicothe 1, Mo

DUAL Auxistry Accelerator Left Foot One Pedal \$6 05. Lehner Company, Ness City Kanssa

RING-Valve Job while driving \$6.00 | terature Mutajoy Grantham 27 Pa

Oil. F. ter Remin 10c Pree Particu ary Zenick Products, Box 266) Los Angeles 54 California

PARTS Model A Other Rea Matio Bux 135 San Pedro Call Reasonable

TREE Grant Auto Parts Cats of Thouns da Sentce Oadgets, Custom Equipment. Bend 25c Postage Befut dable Automotive Industries, 5805-PS-5 Beveray, Los Atmeles 22. Casti

JEEP Owners-V-8 power read Jeep owners ad. Page 32

AUTO TRAILERS

CONVERTIBLE camper, Compact, lite Weight, sleep 6. Order three-view draw-logs. Spect. photos \$1 Falco Products. Box 55 Gloversville. N Y

BUILD Expanding eight foot trailer Accommodates five Literature 10c Pramar Company, Wilmington, Massachusetts.

USE THIS HANDY INDEX TO FIND WHAT YOU WANT

hiteert vitat. Administra für Administrari-kganga Musi auf. hinn die the training on the standards An sur Se P TERMS & Attel us. Ha tertee Constature file.

He as the stard Motion by Jilea file.

He he he Wagat so

he eve him hard so He ers him hard on He ers hereby Julius Highligh hame Bur it Whatesale I atterna Photo Augustion

Lett g P a there & Tests

Let g P y the hitting Thath Tathe

Toom ey & Physics

Let g Marret s

Let g Photo Ding a negative of a

to but a death themstern & Pete fiducit onet & In thermal I a to at disk the did into a line a Partita di Versianiona. Batal firm Montre B. c.

Farm Machinery. Forma the arthur historia. Por live to see Parking the Parking to the Parking to the Parking to the Parking the Parking the Parking the Parking the Parking to the Parking the Pa

SHIP A TURE Louis Courses Treasure Products

Heigs Waitlerd

It is graine no everyon

It is an are supposed for each neman. Inventions Wanted Later Days Challen

Markers v Total Standiller Etc.
M T h Papager) :
M factor of a v & Prescribe Williams

M a second M a second figure to the second figure to the second figure to the second figure to the second figure. M as a figure to the second figure to the second figure. Make a figure to the second figure to the second figure.

of Interest To Workers by Jensey Wat-cold Scampe Wasters Watches.

Palent Astorneys Palents For Sale Personal The right Principles Photocontes the Place Storm Property of the second of the Make TV has so & Equipment to a Blade had the blood hamps & Diffe Supplies

Si et ng Cen de Gunn, Fishing Tachte. Strong Converting

Int on my Supplies

I all A P or

Trees Shy Pa Hamba & Herba

I a secure era Types hers & Other Hackings Wanted on Buy Warrier to the service of the servic

We dop a terms kinests to es Hand Trucks

AND SUPPLIES

RECONDITIONED Motorcycles and motors Christian accessories, Complete stock I den parts Espert rebuilding. First service I den Moiorcycle Sales, Kansas City 27. Missouri

MOTORSCOOTER \$10. Motorbike \$5, 1000 engines Williams rightes Williams righte \$10 Briegs 10 Miget car \$40 Crosses Station wag in \$5 \times kausger, chassis wrecked \$20 \times Mattings for Directory Caralogue N mber \$2 Asting these and hundreds of other bargains in miget cars muturacoters homebunders parts plans etc. Midget Motors Directory Athens. Other Motors Directory Athens, Ohio

NSU scholers and motorryclet BMW midderive 2 to 35 HP shalldrive and the addive Butter & Smith. POS 45. New York 24

MOTORSCOOTER 16 00 Indian Meter-Starter: \$.3 % Send 35c (15c ft et class mait for catalog . 33 jammed with sensational bargains in motion motification plans. Gad, 3313 Jefferson, Torego, Ohio.

AVIATION

BUILDING Your Can Alto ane to Easy with our New Simplified By to Playbor? and Fut Bug Construction Blue-prints For Details (with Photographs, 3-view and Cut-away Drawings) Mail \$1.00 to Stite Aircraft, Box 30848, Riverside Collifornia side. California.

Bt ILD Your Own Plane' Cumplete plans, tostructions \$1.00. ABC Pub. ra-tions. Box 849, San Prancisco 1-AA. Call-

SMALL Helicopters Theory and Oulde Manual Drawings. Construction Data. 67 00 Sandbill Aircraft, Box 336, Atkinson Nebraska

"GUIDED Missi'es and Satellites compiete 100 page il ustrated book simple everyday laneuage \$1.50 h day money-ba k guarantee American Electronics, 1701 Briant Ave. New York 56 N Y

BUILD Filing Positions Scale drawlings. Paris descript in \$2.00 Shriby Box 575N, Ber flower Ca formin

MELICOPTER Mechanics Urgently needed Train at home Write Southern Cross He scopter Institute. 178A Buidwin, Jersey C to 6 N J

HOMENUILT Helicopter Randbook

11 00 Homebuilt Designer (Lightplane)

14 dbook \$1 00 Homebuilt Airplane Directors \$1 00 Teabur Bit 4332 NP Stathin Sun Dero & Cuiffornia

PROPFILERS plans supplies for air-boats and snowplows Latest designs prompt delivery Catalog 25c. Banks-Maxwell, Box 1301G, Ft. Worth 5, Texas

HOMEBUILT Relicopter rolor blades Tall rotor kila. Pictures. Specs., prices.

ASTRONAL TICS

NOW II Join the United States Rocket Society, Inc. \$1.00 per year, under 18, \$3.00 per year over 18 Oldest rocket society with a continuously published magazine. U.S. Rocket Society, Inc., Box 271A. Filtman Nevada. USA

SAFE Rocket Materials Samples 25c. Central Rocket Company, Box 22t, Waupaca, Was LOB

49 48

144

61

117

罗宁

8.6 72

BATTERIES, GENERATORS, ETC.

EDISON Nicket Storage Batteries. Any voltage, any amperage, Unconditionally guaranteed. Power Plants. Generators. Motors. Literature. Hawley Smith Co., Croton Falls 1, New York

ELECTRICAL SUPPLIES & EQUIPMENT

St. SCTRIC Penci) Engraves all Metals, \$2.00. Beyer Mig., 100.1-C Springhese.

LAMP parts Wholesse Trousands of items for rapairing, converting, Can of 15c. Brown Lamp, Box 385D, Clayton & M trout

WELDING, SOLDERING

BUILD-Your-Own welder or welder and power combination. Low cost unit conserted to used engine lets you weld anywhere. Pree booklet tails how Get Into profitable welding business. Write Hobertarid Box P set Tt v (8 to

ACRTYLENA Welding Outfits new 254 at Archeidern & t. of Engle Welding Dept. 42 3645 Brundway Chinago 46, I l

NEW A is different oxy-acetylene outfit we do not beats, brazes, with interribe grable 77 is. No attachments needed is a portable Companie outfit for in at all the in \$104.50 pages a major and the plan for oxyger and acetylene a page With a for free part of back 2 land 5 land 17 N Y

WELDERS, 110/220 Weids 1 2 at to Moderne, 1679 Euner Drive, Schemettady New York

A. C. Weiders, four sizes, lowest prices. Proc Literature. Holgerson Co., Canton Kannas

WELD cast from with brouge as easily as you do steel, with our new Piux. \$1.50 per pound, sample free Dealers Inquiries a rited. Webber Manufacturing Company 1503 Adams. Loveland, Colorado.

Mt. Y Welding Supplies Direct From Mar Jucturer Cable R do Hemets Arc Welders and Kils at Tremendous Savings! Free Factory Catalog Includes "Build yourself Welder Plan." LeJay Mrg. Co 2022 Emerson So., Manneapotts, Manneeotts

MACRINERY, TOOL SEPPLIES, ETC.

PREGROUND tool bits, other tools, Pree List, Tool-Craft Co., Cl., Conderaport, Pa (r.) Drum Coment Miner Assembly Kill Crass. Mu-Way-Do Co., Newsym. M.C. 1488

A M Manual Metal Punches 1, To 1 , Thru 18 Osuge, Abdon Netts Tools & Dies, 1831 B.E. 49th Avenue, Portland 15, Oregon

AURPLUS Socket Wrenches, Malf Price Davis, 2008-C Lakeland, Ebreveport, La

OUR Tool Listings-18c, Tremendous Values, Surplus Sales, Jacksonville, Texas

9A THIGONOMETERS

* ENGINEERS, Draitimen Stude to Transposator Makes Trup cometry Pary \$1.00 No C O D Triess Son St Suffaio 15 New York

10 ENGINES, MOTORS, ETC.

DIESEL Injector Parts Wanted GM51-71-119. Mayer, 7126 Carnegie, Cleveland 3,

GAS Engines, Briggs Stratton: 2-214 Pt P Recoil Starter (ast Iron, Enrizontal) Shaft Brand New, Factory Fresh Latest Midel 4) Were Frank 64s so Suss as Prire 544 50 F eight Paid Karala, Phi w 16 or m re) M ser Back thursas see De tama Free Morthern 178-8 Morrisons | Birret, States 14 Mans

SERCIMIC LAND Save time Save motors Determine unmarked leads double vitage 20 is further motors. Diagrams Simple traffic pain both size and delta 8, 40 Box 666, Florence Automa.

REWIND Motors yourself Comparts instructions \$1.00 Lewis Mfg , Howell 11, Martigat.

10A FARM MACHINERY

SENSATIONAL Garden Tractor. H. on between p.s. to and rows introduced singuished being Nothing class this Unit Patent 3752546 Also to in Paritantic offer to first few impairies. Auto-Hos. DePers 68 Wisconson

ton Wheres, axi es, hand thecks

RUBBER Tired Disc Wheels—For Highe, Parm Is dustry Over 106 state capacities Ball, Roller, Otiste Bearings. Axles, Pres Specifications, Prioss, Mobile Wheel Co. 15.6 M Carnali Ave. Detroit 14 Machigan.

GRIZZLY Wheels, 6" Diam. x 21, roller bearing, flat rubber tires—90 00 oa prepald. H. Wilder, 5119 Bradford Dr., Dallas 35, Texas.

II BOATS, OUTBOARD MOTORS

NEW word, rebuilt marine motors, Marine conversions, fittings, Free Calalog Stotes Marine Supply, Dept. 23, Confwater Math

PREE by catalog Beat Ests save to to 2.3. 'a tory be to prove 4 through 13 outboards descried for amateur assembly Tour v. Prove as Hardware Access Rd. Minneaux is 30 Minneaux.

SAVE Money New, used outboard motor parts. Send wants Stamp and enacted Outboard Motor Mart. 229-8 State. Boston 9, Messachusetta.

FULL size, cut-to-shape boat patterns, historia is ", at test this row so per illustrated "Build a Boat" Catalog of Naval architect-designed Cruisers, Runabouts, Saiffs, Ou'board Boats, Saifing, Racing Houseboats, 50c. "How to Build a Boat Boat at 12 to Hardaale & Egos, test Catalog, \$2.00. Cieveland Boat Boat Boat Co., Dept. A-17, Box 1651, Cieveland, Ohio

BOAT Plane Plane Fatterna France Kill Moder School and On South 1 2 attained builders. Complete New Catalog 500 or aprilip requirements. New Speed-boat It has a Hardanes Catalog 250 (c) Market 9 2 Roserta in Residence Ca. 1 DISCOUNTS. Mem. Outbooks. Motors

DISCOUNTS. New Outboard Motors, Box & Desiritor o M Nº R came to all P BERGLAS heat covering a session

P BEHILAS heat court of a sensor prices 2 re Laterature heriert a hus 312 Defera Wis Making Two Hartproof nonmag ette

MARINE Two Halfproof nonmag ette Pattena Attonia the the tree of the two following the tree of the tre

MARINE conversions, Ford, Chevrolet Va Jeep engines. Catalog 25c. Lehman Manu a luring Co 971A Brund St. New-MR 2 M 3

CATALOGUE, heating flags, gifts, gadgets. Send 25c, Refund first order Lighthouse. 32 Court, Flymouth, Mass.

PROTE C. for Cate of on Mare Production Priced Hall Que to K.f. Scate Comments La F. World Total Marie W. advent Post 548 486 30th Ave. N.K. Minimedical Marienta

BLY Surphis boats archers companies the seals experies time oran is general total per fus radio tere, or sea period etc. direct for a passion of Denot list Proceed to \$1.00 Surphis Center Dept. Ph. 5. Et etc. Period.

WATER BEI ME temprated Rave So Quamber, 6 Route 68 Ht loater Mints FilhEste LASS rour book Windowskie service Auto Cone 2012 A Lade to Calif

COVERNMENT Sells—Surplus Boats
LAT s Lc P a Aircrafts, Helicopters
Jeens Trucks Truckers Radicte exchange
M s Bus florest now from U S Covern
the t and legest last & Procedure's
a co Boa S File Some valde 6 M Y

title FRMSCHET Surplus New Distributats for C. raises M. E. F. g. es. Visige B. S. Or v. 63 Mers Cr. s.v. 618 Beinbridge Bt. Pt. indetphis 43 Pet in

Pass Patter of the alog Mc Maranecraft. B. s. 16 P. D. gt. s. Mass.

US BODY BUILDING COURSEN, JIC SITSU & ATHUETIC EQUIPMENT

With P powerful arms, chest, shoulders! 22 exercises. \$1. Ponsad. Box 601-C. 1140 Market. Wilmhiston 50 Delaware

KARATE, Power splits plants, impromfy Bure-handed. Absolutely no armineks, the day. In own Energed Edition 31 sepond Jimms Lee P. O. Bez 245, Cultimed 4 California.

With R. Merght. Now to frerence - Eng. Belt Course \$2 10002 Pathients, Repulsade Ca. 12

BE Tailer! Amazing guaranteed instructions \$1.00. ABC, Bux \$40. San Francisco 1-TA, California.

OUTSTANDING Physical Development' Any age New & aresteed Discovery Com-Only & Paper Strength Health, Muscles Gall Reduce Prev Details Repercing 4034-B Art, San Diego 15, California.

BUILD Barbells, dumbells, using concrete, u per raca, instructions 6 of ever class included C. Typer, 23022 Gault. Caroga Pers, Calif.

PUSHED around? Don't take nother to from the let O to them the shock of their time. East when you know Police fin Jitus Complete fully illustrated course in one volume as taught police and armed forces Send 11 new Money back guarantee. Books Publishing Co., Amityvide 26. N. Y.

RARRELIS Exercise Equipment Realth Strength Physique Bootlet. Its Reading Barber. Co. Steading Pa.

BARBELLA, Dumbhelle, Exercise sentpment Courses Free bookset Quad Barbell Co., Silonta Springs, Ark

FITT D GLASSES, TELESCOPES

FREE Catalogue Thousands was surplus onlics; bargains Lemes. Friams. Telescopes Binocaura, etc Send \$1.00 for 10 Lens House at het and Project bookiet. O Jacgers, die Wast Morrick House, Landrous, New York

HULLD your own Reflector Telescope Complete k I Mirror E ended T good at at ar a restaute Request free plan trated literature, Criterion Manufacturing, Dept. EP-41, Hartford, Connecticut

WAR Surp as impairs his sens of lenses thereto ento be es upon be as upon the policy of a structure of a principal form of the policy of the p

REFLECTING Telescope completely assembled out 120 % counts red Opsent ed out 120 % counts red Opservatory trearment. Free information Skyscope, 475 Fifth Avenue, New York 17

AMAZING prices, precision binoculars, Polder 'Binocular Selecting," catalog free. Dealers wiso write, Prentiss Importers Mercury Bidg, West Los Angeles 25 Calif

MEPLECTOR Telescope Kits \$7.25 (3") to b. 2.00 (12") Mirrors cells. Pocusing Mar to I speak by a view Art 1.5 even that I speak by a view Art 1.5 even that I seem to the Art 1.5 even that I seem to the Art I seem I
MINOCULARS, telescopes, microscopes Tetrafic values \$3.50 up. Request Irea money daving catalog. Criterion, Dept 8-66, Hartford, Connecticut.

ANTHONOMICAL Books Sant Atlantes. free list, Herbert Luft, 65-11 229th Street. Ha 5 de 64. New York

MICROSCOPE Catalog 25c. Research Scientific Supplies, 126 West 2316 Milest New York 11, M. Y

BUT Direct From Manufacturer" Mirrors, kits, Senses, parts for astronomical telescopes Mirrors, Senses repullshed Price list on request. Eistner Box 76 Waksheld. New York 66, New York.

UNITED Binoculars, Riflescopes Spotting Scopes, Lowest prices ever At United Description of the Control

REFRACTOR and reflector telescopes.
Also in tract or telescopes from the track to the first track from the first track from the first track for the first track from the first from the first first from the first from the first from the first from the first first from the first from the first from the first first from the first from

DYNASCOPE-Sensational New Reflector Telescope Send for details Criterion Company Dept DS 49 Hertford Conferencet

PERING TACKLE SHORRY, TRAPPING

ROW To Catch Fish With Smell, Secret Recipes, Formulas, Mathods, 35c. Jacksons, 312 Lake Avenue, Ithaca, New York

100 000 PRODUCTS Wholesale - Free catalog! Send postcard Fron-O-Mart.

BOUNGFRANCE Austractioning Prints 35c gas anteed fight Em Auderson-Ph. R. I. Terrico Trans

BCY W much Onit Eq ipment Wintende, Crys at Cruf Bairs Crys a. Macogan

PREE Client and Wholesale Sporting Cleuds Caiming Livest a reale prices Carniete and of the left tackle cameras to flarger with a partial to the Cultivate Lodge Saits Perfect Kalena City Missau 1

PREE 153 Page Pishine Catalog-Incudes latest Do It Y wast 1 hits Reteraft Company, Dept. A5. Toledo 13, Ohio

some Saktialies freeton betordars, war read catalog let busith Museum, Runnemede N J

BARBERTE Patented Shakencouf Hooks Sample and Illustrated price list Me. V Seames Rt 18 Politaioun Pa

CATFISH you should use my formula and method for best results, right now, with see a 41 00 to Fish Formula, Dept. Physic 1200 Elia Pt Wurth Tyres

MOLDS for Picherman's Strikers, Jun. Se. ds Casting and Sr. ning t res Pres Calaparte Sweet's Molds, Tohawands & New York

LUGERS' Mauners' Cotts' P. Me Renbickies West erbin' Artique -- Modern Guns Outremoties Suier Bergeln Calalog only Mr. Agramonic's, Touters 2A,

JAP rifles altering American shells 66.60. Jap shells 25.55, catalog Sc. TP Shop, West Branch 16, Michigan.

CAMPING EQUIPMENT

TENTS direct from manufacturer wor,d s largest selection Low prices Send 25c (print name-address) for 100 page consists catalogue of Tents Campilg Equipment, National Camp Sites guide & Camping handbook Morsan, 10-15G 50th Avenue, Long Is and City 1, New York.

IT DOGS, MIRDS, HAMSTERS, RABBIES & PATS

WHITE Berman Shepherd pupples Theatrical dog trices, Kings Massistah, Wis-

HAMSTERS—Golden, Young \$3.00 pair breeders, \$4.00 pair New mutation \$5.00 par Ad rought hamstery Promotel 13-K. New York

RAISE Rabbits of Mink or \$500 month plan. Free details. White's Rabbitry, Delaware theto.

HAMMIAN'S TOUTH Conder pairs \$2 apbreeders, \$3 ap. Free bookset. Saram Hamstery, 1044 First East, Ocksloots.

MAKE Big Money Raising Nutria, Chinchillas, Cavies, Mink, Rabbles, or Pigeons for us. Free information, Meetey Brothers, New Preedom, Pennsylvania

HAMBTERS—Ideal Pets, \$2.55 pair Free | 36 booklet, Jer-Fre's Hamstery, 2216 East Proadway, Muskegon 14. Mich

wit pay 13 50 in desed throw Mushrounce Celer shed and outdoors Spare for time tour round We have 2 300 is calculate Fee Book Washington M. I. roum 1 d Dept 117 2804 Admital Way Seather Wash

ALIVE-Animals, Birds, Reptites Catalog 190-Ray Sugieton, Rattiesunke, Fla

III LIVE BAIT

\$10,000 YEAR pear best earthworms 33 Page booklet fells how Jo. Mossouri Earthworm Herenich Box C-6641, Kab-lan (O. Massor)

APRICAN GIART Redworms. 100-42 50 (Dealers quoted) Ozark Worm Farm-V.

RATRE & statements Red Worms east first one Medoud Three Onto. Dreeden

INA PRIMERAINING

PHOG. Crayfish Raising. Profitable. Brothure, 61:00. Vol Brashears. Berryville. Arkansas

FARMS, OTHER MEAL ESTATE

PLONIDA-Nice humanites, \$348 at \$16 monthly. Poider Free. Wantree Vernor, DeLand, Florida

PLORIDA Trailer Homesites, Weter System, \$495.00, \$10.00 Monthly Lake Privinges, Box 2005, Deland Florida.

PLUICIPA Water's at Homes es modarate priced for set rement. Mustah parmenta. Good fishing, hunting. Adjoins Ocala Mational Porest Grace Parker Passle, Lake County, Florida

PLORIDA—Half acre tracts—high-dry Mear Gulf Beaches Raise your own truits and vegetables. Only \$795 00, \$10 00 down \$10 00 mm. Information G. B. P. Mar. held. Owner, Dept. AA, Uplon Bidg Charleston, W. Va.

BTROUT Catalog-Free! 2,134 Bergains.
14 States. Coast-to-Coast Farms, Romes
Businesses. World a Largest! 55 Years
Bervice. Strout Realty, 251-28 4th Ave.,
New York 10 N Y

FLORIDA — Big 80 Foot Homesites — 1250 at \$16 monthly Beautifully wooded Call Report Area, Also 10-Acre Farms at \$25 monthly Money-back Guarantee Brochure Free, Douglas Wood, Fountain, Florida

MOUNTAIN compattes humerites near river \$65 \$5 down. Free literature Charbe Pratt, Box \$331. Oreensboro, N.C.

TREES, SHRUBS, MOODS, SERRA

RAISE Your shrubs, trees from seed Free u.a.tine mide price list. Woodlot Seed Co. Norman 66 ht chigan

OINSENG Goldenseal roots bring up to 6'4 your d Puls information P O Cocion. Viola. 1 wa

36 CANNA Flower Bulbs, Top Grade 84 05 Fostpald now, Refund Guarantee, Color Folder Free, Nell Horn's World's Largest Canna Farm, Carnegle, Okia.

GROW Large Trees in Weeks Arcient C7, ese method pass palented Arways plattic grows roots on in 50 branches—which are then cut off pasent tree and p a fed Complete kit and Habrachons for grows g to new trees \$3.25 Moses back Course tee or write for further infirmation. Agri Plant Barancia 22 Florida

EVERGREENS Grow your own from needs Large parkets 50c 5 for \$2 Blue Sprace Scotch Pine Arbor Vitae Juniper White Bories Catalog Madinger a PhM. North Lima. Oblo.

to MIXED Cucton Seed 50r Cash-156 for 51 M. 1636 East 7th St. Tucsen.

POULTRY & SUPPLIES

4 t | F - F |

ELECTROCUTE Rats Mice Send He E Abbey, Akron, New York

22 PROPITABLE OCCUPATIONS

85000 PROM Half Acre growing Ginser's crop bould Particulars like Associated Growing Specifing Man toba.

BAVE Money! Buy Wholesais: Free Cat sing General Merchandine. Morris, 447-E Broadway, New York

BIG Profits in Welding Easy to learn Law Cost training to retraintely resulted. Man Prunt tellers Of Approved Write for Free Bookset Hobert Trade School, Box P 501 Tray Ohn.

FHER Priuse Poider How to Make to 600 00 Year ; Sparetime, Backyard Rasting Easthworms Oakhaven-I, Cedar His Texas

SENIJING Machines—Ru Redica Operate A Resident Com Machines And Laria Amazing Profits 32 Page Catal & Free Parkway Machine Composition, Dept. 17 7.5 Fower Screet Radinal v. 2 Mar. 1404

WHOLESALE Price Lat Pres Save 30 A, Lances. Concres Sporting counts. Housewaren Hardware Jeve' Concres forts etc. May-Rite Hauthorne & New Jersey

PREE Book 365 Odd burcessful Bust heaves Work home Pecific—37C Oreanaids Calif

BLY Wholesale 25 000 National Advertised Products Get Amailing Deast Catagon Compate Details Five 5 errors Wholesalers, 1841 F Leves Davis T Texus

MAKE Money Selling Recipes and Household Hints by Mail Information Pres. Barrett, Dept. CA-28, 1464 No Clark, Chicago 26

SUCCESSFUL service business Low n vestment. Hest. 736 Granville. Vancouver 2 B c

SNARVS, Linards, Turtles. Progs bring root store for full or part-time collectors. We but and sell all hinds and some and auantities. Pree Collectors Brock or complete details. B. size call Exchange 171. G. Wag set Lane. & Page Tetas.

SECRETS of gold buying! Ruge grants Sources inexhaustable Pres information Davis, 1306 Paul, Norfolk 5, Virginia

15 00 1ffol % Scare Time Stargerite Write R Z A I Purpose Stargemens, 22°0-NSE Milwauken 16. Wis

SUCCESS Abead! Assured, extra cash for any and tour stred upon Conservation to be A tout Marketa Health in Methods Ad seed Surgean A-Z, KDR-23. Noz 4 IA Kis-n N J

PREE Literature-Make Bre Money Raising Fishworms and Cricketa Carter Farm-10, Plains, Ga

for could be desendent with your car for me has reen Themsends each to he do me the mest Request to terest in facts today National Franchise Reports PS-528, 333 Burth Michigan Chicago I

WE Pay 33.56 In dried Grow Mush-rooms, Cellar shed and outdoors, Spare, full time, year round We have 25.000 customers, Prec Book Washington Mush-room Ind. Dept. 101, 2054 Admiral Way Seattle, Wash

HOW to Win Prize Contests", "Type-writer Profits" Booklets Mailorder, Drop-shipped. No Inventory Investment Samples, Information \$1.00 Baver, \$105 Betty Avenue, Neenah, Wisconsin.

Property Blind Laundry Free Sook Burtt 2434EE, Wichite 13, Kanese

PREE Book "906 Successful Little-Known Bustament" Work home Pymouth, 1410A 43rd Street, Brooklyn 4, New York

56.000 FOR Minter Mrs. 53.5001 Pree "Secret Journal" Plan, Magical! Work home Publico-N44, Organiside, Calif

\$30-\$66 WEEKLY sparetime addressing erre open I prog of handwaring instructions in refundable Resail 2.6 Fifth Ase Suite 1102-K, New York 10

LEARN Invisible Reveaving At Home Proc Details Jack's Service, P.O. Box 1651 Presport, Illinois

Roll LETTE System successfully being pased Europe U.S. can be tested at home C ad pass on to others \$1 cover expenses Starford Box 1124 Grand Contral Station New York 17 N Y

REVICOUNTY To Surrous Via Mailorder Amering Pac a Revealed Portune Enterprises Addison, I study

BOOKS & MAGAZINES

SRITISH Book Bargains. Any subwet Catalog free. Transbooks. Box 1-FTC Wantagh, New York.

GOOD Used Books, \$6c-\$1 Proc Lists Editions, Dept PS, Hompstend, New York

BOOKHUNTERS: All Subjects, Send Wants! Jaher Book Bervios, 183 Massiwood Drive, Weethury, New York

WE want to buy out ropts of Pooular Science any issue from period 1890 to 1915 Condition not too important provided backs are complete with the pages received write to Buy No. 300. Tuckshop, New York

ATHEIST Books Catalogue from Truth Sector Co. 35 Park Now New York 6

BOOKHUNTERS Bend Warts Atlantic Book Service, 16 Coder, Charlestown M.

2306 TITLES! Every Subject! 10c no! Catalog Free! Modern Mailway, 236 East 8th, NYC 3.

Pres. New York Labor News Company Dept. P. St Cliff Street, New York 38, N Y

PREE Catalog! Hundreds of subjectat Treasure-Site Buck Co., 279 S. Aldes. Philadelphia 30, Ps.

NATIONAL Geographic Magazines 1868-1852 An issue Per dica, Service, But 461 PS W. mt. gton Demonare

POMICS Norma Magazines wholesale, retail Cutakene Pres Backdates, 2:01 8 Lumberd Baltimore 2

BOOKS Free General Calabos 100 pages Test a scattoral educational instructional subjects. Militare of returned new and used Bargain of ea Monte lesught flat 1902 Langs Callege Book Co Dect PS Cultumbus I Otio

CRAZY book titles. Free hterature Lynch, 407-8 Hazleti, Bultimore 29 Md

DINPOSAL Saie 12 New-Used hooks in cluding giant novels \$1 25 d 7 42 Extra special 40 diff \$2 only Persil 436 W W Ave Breek n 25 W W

JOHN Pries d Bunkfister can get the books and mark Pres Sea ch Service Bun 23" 1th Long Beach 1 Ca Joss in

FREE Book Catalog Many Interesting Subjects. Books Publishing Co., Amilyellie 30. H. Y.

WORLDWIDE Encycoundle Ten volumes Dirt Cheap Home Service, Quicksbag, h g rin

HYPNOTISM

Past, Modern Methods Complete, Illustrated Course, including self-hypnosis and Secret Herre Pressure Technique (burn anced Harmless)—\$1 00 M. Powier, 500 Draper Ave., Schemetady 5, New York.

Pictiff I satrated Happart am Best apmosts Cafe ague Write Happartial \$721 Brisel Haward 64P Cas faction

HYPKOTISM New proven home study course. Complete section on Hypnotherapy N. Christisks no sadgets Mines back further for Cyrificate swarded Midwest School of Hypnotism—Box 84—Bellwood, Illinois.

Prescribility Amount guaranteed 25 peace course 36c Mindreading Course \$1 00. ABC Publications Box \$45, San Francisco 1-HO California.

PREE Catagory Hypnonism Autohypnosis! Books Tapes Records! Drawer Page Ruidoso, New Mexico.

TRIES IS CON The months' Runte Franches offers commercially course begongs, as considers in for self-minimum. The manufacture of minimum and certificate. No gadgets, and a Woodman Avenue Van Mays, California.

XRAY hand' Hyphotize, one glance Guaranteed 5) 60. Wamsteker, Box 16. Ottery Cape. South Africa.

HYPERITIZE One word One fingerson; or stage \$2 for I hypnosis I mb-by-lamb Technique' \$2 Satisfaction or ref ad Hammanaigh \$46-56 Superiside Chicago 40

LFARN H profilem our bunk 25 lessons on H 1 belief share how to act seve bustsees and seven success. If postpa d Satpraction guaranteed Books Publishing
Co. Amitwelle 26, N Y

COMPLETE hypnotism course, 50c Free Catalogs. Collins, Box 67, Appalachia, Virginia.

244 GAMES A TOLK

DELIGHTFUL Toy Belicopter Files Gracefully, Lots of Pun. Perfect Gift. 43 Each, 45 for Three. Robbins-12, 219 Eachart Medical, Oregon.

MAGIC TRICKS, PUZZLES, ETC.

WORLD & finest professional magic John novelies Giant il ustrated culaion toc Top Hat Eva-ston 13 Minute.

1.00 NOVELTIES, Johns, Trices Gadgets Puntrakers Hubbles Big catalog Its. Johnson Smith D-421 Detroit 7

St Louis) Museum

JOKES, Games, Novelttes, Unusual merchandler' Catalog and Gift free! Treasures, 2006 Esymbors, Retwood City, Calif PASTEST Service to magicians for over 10 years Send 10c for an ages famous Cutu-og 500 Tricks containing magic for pocket parior stage with he is coins cards cigarettes ropes, sides, appara at Divigues Magiciand. Dept. 36. Dalies. Trias

Bit a magnetar Large professional catalog of latest tracks life and F-400 North Dearborn Chicago 2. I note

SPECIAL Choice jokes tricks package plus (ata er 25c Carong a, Howard Cory D 5, M east

1 COINS & CLURENCY

\$4,000 00 FOR 1913 Liberty Head Nickel. Uncirculated Dollars 1806—1839, 1893 S. 1895 P. 903 O pay 1,00 00 45 500 00 Certa o Dates Line b Ce ts by re 1932 - 6 00 00 Pitig Eagle Certa- 3500 00 Index Cents 1 40 00 Dines bet re 1944 - 82 000 00 Quarters before 1924 6 000 00 Ha f Di att before 905 6 000 00 R Pieces 6 30 00 Ha f dimes 3500 00 Handreds of a rere with 1,00 0 6,000 00 Ca adian C a 1944 - 87 Super 3 00 00 Ha f dimes 5500 00 Wanted 200 Pieces Old Cital Paier Mouer etc Our La sell intrated Guarantee Busing Se 16 Catalogue City a Complete A loom is interested to a complete A loom is interested and a cura War Loom is interested and a cura War Loom Catalogue City a Complete A loom is interested and a cura War Loom Catalogue City a Complete A loom is interested and a cura War Loom Catalogue City a Complete A loom Catalogue City a Complete A loom is interested and a cura War Loom Catalogue City a Complete A loo

teET Front and Pleasurs in collecting old coins Send inc for 34 page constrained or n stated You'll be de a ted with it Beid for it now B Max Meh 376 Meht Bidding Pirt Worth Texas Largest ture tour establishment in U.S. Established Mireara.

COINS from Pormosa Vatican etc bids fore an backnote (or with core approvada Littleton Company Littleton 52 New Hampshite

INDIAN Cent puis Bargs it lists 10c N tol (160m 5, But 4141 Philadelphia 24, Peniss

32 PACE Informative I'S Il setrated coin list for Stoney 192-5 Washington, Bester 6, Mass

.058 CANADIAN Commemorative Street De ar unifera ed plus Canad an Billet i, \$1.50 Maries Numiamattal. But \$13 Caigair Canada

REVEN Brillant Uncirculated Coine Last two years commiste in mage San Prantice with Price Late \$3.00 Two tels - \$5.00 Louis Bed, Box 1575 Decatur Alabama

Ct IN collective largest newspa of Baro to Mc Numismatic News, Jose, Will-

VALUE Packed American Cote Caland 10c S. Ivan a. Plotteer Building Bt Paul 1 Minn

1943 ATREL Cents PDS Set Seriant Fairs Pine \$1 90 Yan Riesch, Simper With

THREE Different Indian Cents 25c Lint Collector's Bargains. New Moon. Penna

BYLLOUT Values US Coins Free Lat. Right 522 A Second Avenue M.W., Kilkery N.C.

COIN Magazine, 160 pages. Sample 35c. Numarmatic 7120 Mamaukee Chicago 31

MILVER De ara Uncirculated 1880-CC Unreigh 883-CC \$130 each 1893-CC \$13-00 Allcoin lists 10c Husden a. Oarwin

RARE 1801 CC Mint Do or \$3.00 New 100 pp catalogue, 25c Shurts, Sait Lake City 10. Utah

1 TNCOIN Cents 1976 B 1842 5 1847 D 1847 F 1947 S 1947 D A u reusted to the complete price at price \$7.00 Perms Mart CK 14 Bit \$25 Chango \$6 F 1846

LINUOLN Cents 1909 1920 S 1921 S 1922 S 1934 S 1925 S 1926 S 1927 S 1938 S 1948 S 1948 S 1939 D 82 00 R and Berry 14162 Nancy Lee Dy Westma s er Ca firm s

COMPLETE United States coin barrain lists Ind anhead cent 10c Economy Sases, 156 B Dean Manate d Massachusetta

INDIAN Cents 4 different for Large Cent 4:00 Price list for Raid Coin Co., Box 5 Decence N J

BRILLIANTIZE Coins Sale for Proof

10 DIFFFILENT Foreign Coins including larger pieces and 0 der dates 5, 00 Catalog Free Alfred Sangu. Box 181 Jackson Heights 72. New York City

PROOF Setz 1856 art only £2.56 1857—)
83 00 1856 -84 00 1955 - 86 06 .956 -8 00
.853—6 2 00 1872 8.8 00 .95, 829 00
1950 54 00 Complete set 1850-1958 inclustre 8 20 00 1943 (f. piece) 836 00
1841 -874 30, 1840—843 80 .978—832 00
1841 -874 30, 1840—843 80 .978—832 00
1841 -874 30, 1840—843 80 .978—832 00
Cluberte set 1836 1858 inclusive \$830 00
Played set 1836 1858 inclusive \$830 00
Played Set Dans—Dan Moratha ANA
472 S 2376 And San Francisco 21 Castforms

FREE Bonus!—with each \$35.00 portion of your order you get one Silver Dollar Bushapi Caurena ed 1921 P. S. ver D. Part Care to the Mart 188, CC 82 CC 82 CC 84 CC 85 CC 9, CF 06, 7 5 00 CC 85 CC 9, CF 06, 7 5 00 CC 80 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 8 100 CC 87 CC 83 50 Part 189, CC 80 CC 87 CC 83 50 Part 189, CC 80 CC 87 CC 83 50 Part 189, CC 80 CC 87 CC 83 50 Part 189, CC 80 CC 87 CC 1800 O \$1 00 PALS \$1 O \$2 O \$1 O \$4 J M O 10 O 10, O to on each 1495 O 8 5 08 Pr. ade at a Mat 18 8 P 10 P 80 P 8 P 82 P 83 P 84 P 85 P 86 F 40 P 80 P 8 P 97 P 80 P 1900 P 18...P Margang 1873 P 21 P 24 P 25 P 81 81 85 con 5 1894 P 1802 P 8..00 co. 5 6. 00 ea. h 1407 2 44 P \$2.0 rach 492 2 Lu 00 each Born as Our Sesent in of 60 75 P \$30 00 per 0. 8 82 5 87 5 4 90 1 0. 8 82 5 8 5 88 8 9 8 3: 8 22 8 2. 8 25 8 8 Th: 8 1867 P 835 08 per r. . 4. O 82 O 81 O 64 O 83 O 187 D 27 D 817 00 per r . 1 78 CC 82 CC 81 CC 84 CC 78 O 87 O 68 O 81 P 88 P 840 00 per r . 8 CC 88 C 845 60 art top (826 8 81 CC 82 P 97 P 30 c) 830 00 per r 90 8 80 cC 855 00 per ro 2 81 4 1802 4 90 CC 800 00 per rock 24 8 23 \$1 865 00 per rock 84 ft 8 0 00 pet 2c . 91 CC (1100 00 per to . Everity of Postpand to Day Morey Back truster to of Mattatact of Thurst day of their route Proof Sets theid Sort Day are Ce to ple Prop other it Send tour water than We may be not a W at do on harr' And parase name; or prie Postal Prid is Cimpa. Frat Ma Order Joe Gredon ANA 5016 SC Ca farma Street Ban Prancisco 21 Cast-100.00

STAMP COLLECTING

TWO 53 00 United States stamps paid 20 different 10c of h CS are valle Irwin A amp Co. Box 2100 Brookers 20 New Y cs.

AMAZING) Offer 200 U S stamps— Inchid g seminents of airms a high der minst six to \$2.00 or 5 too to Apprica. App. ants. I ustrated Bargain Lata free M 5 is Stamp Co. Dept. 35, Can den. New York

ICELAND 10 different besutiful stamps |
for or 3 10 fert's to a, 1 arm for our
good old fash and appr year Old Colony
Stamp Co. Dept. B. M. ford Corp.

UNITED States commemorative relection on allower 13 differe 1 10t A , vna W2 to 516 W Avenue L. Brooksyn 20 New York

WEIRD Diamond Shape C five Stamps Love 1 Funer Tria se F at Ame an big commen rative overn a d Idon to et etc. Five with a pri a a Capital Stamp Co. Ferensburg 10 Min signit.

225 STAMPS Por only De This mammith to a pridet Afron a Paterna stamps Ir mail a se Cart so ata gudig or to 25c each Am Am hais Mintic Stamp Company Lamden 55 N Y

PRFE Amazing Lat Ashabetica Two Feet Long Stampma 1 Hartfield 1 Conn W W 1.9 A 1 Different Germany 10c Zepus ins. Semi-Postals, Astmatis. Right en set sic tract Canada bargain late in ided with beautifur a stora s Jamestown Stamp, Dept. AMPS, Jamestown, N Y

PRFE U.S. Stamps. 1943 Plag. Commemoral ses I risuded in C est to of 25 D flerent P as ha unble 25 00 Stamp Au for for for Mat of Charge Approva a Williett Co Box Jul T Yorktown Beights. M Y

FREE Grant Bargain Catalog—New Ed in histing thouse do of bargains includ a U.S. and B.N.A. stamps packets, in starts arbura accessories and supr. reserve with beautiful approvais Jamestown Bramp Dept. ESEPS Jamestown N. Y.

50 000 STAMP Orab Bags 23c each Anderson, Box 1 Reading Pa.

FREE-103 British Colony Stamps, Approvals, Enclose the for unnelling Miagastamp, St. Casharines 4"2, Optario.

50 DIFFERENT China 10c with approvals. Plymouth, Department A-4, Bell, California.

100 DIFFERANT Stamps, 10c with approvals Smith 108U Brooks, College Station. Terms

WORLDW DE 50 a. d ferrat absolutely free, just to introduce our incomparable approvals. Kent Stamp Company, (FO Box 87 Brooklyn, N. Y

US Carris Over 50 Yrs Old 15 Selected of oners Mass g in biggest collections A 15 at res t an 1c each 100 a cappiovan Jaro Box 244 P, New Y re 6

54 PAGE U.S. Catalog Free, Stone, 122 Washington, Boston 2, Mass.

FREE! 25 Different Partorials, Approvals, Marford, Box 44, Queens Village 35, New York.

Q EEN E sabeth Mint Bets Barbadon, Vig a to dictant coblatar Dom, ca. Mana 21 B o t 25c Besstifus Autrovas Common Stamps, Box 225, Canton 1, Ohio

FREE Sample! Illustrated, informative, interesting National Stamp News, Anderson, South Carolina.

EXOTIC! Colorful! Mint, used foreign ests Premiums given with purchases. Henderson, Lindale. Georgia.

DIAM OND Reserved Pope Triangle. Ores: a d Arg a 51 other 5r Apprisals. Longnorn, Box 3068F, Lubbock, Ten

CHINA on tortal meeting — Chiang, Place in the set United Nations become being one to A burns, other gifts Free to our upper the buyers. Ben Stamp Service 175 3 Ben. Colifornia.

'ARE Lincoln" Glant Diamond raintow i world Fire Set, Jarne), South Kotra 50 a read fiveent only loc Approxns Champ ain to Isse LaMonte VI

FIRST U.N. Set Among World a Prettiest Ores and Approvals Wester, Box 1-44 V NYC 2

U.S. Stamps Count Surgain Catalogia -- Inc. Restrict. 355 E. Maidenlane, NYC

Apricial Vary a, Buz tiek, Spring Vares Castlornia

PRFE ' Fing Set p in Flowers Triangle. Appr vals Bramen Davion Tennessee

cit lability Consection Free - Includes
Tring en Fort United Bates Aramana
Commissionalities - British Crimies High have Pultorials etc. Complete Colje tion our Big I instruced Magazine all
free Bend in for pustage Oray Stamp
Company Deut PR Toronto Canada

STAMP Finder World May and Entycloped a of stamp baset of resulties only be A rushis to ath Company, Bethiphem K2 New Ham, so tre

DO 'l Yourself Pretect versable stamps, etc Scaled in plastic, removable, fits alleum, für for sample authentic old stamp in plastic Box 442 Laforai de Oregon

U.S. Commemorative First Day Cover Free W. S. A. Dictain A. Artow Atamps, Box 1905 Ch. at. offin C. L. B. Ok. aborna FREE Tangan ha Nigeria Bohemia

M syla T q and (reers at d Rb des a M assa a d Others Bend 30 Pro see Th its Stamp Company Stares

Martin 2:02 Bentley Los Angeles 25, Caul

GIANT Approvals Thousands Different le and 2e each. Wahl's Stamp Exchange, 7008K Parragut, Chicago 31, Ill.

FUNDATUAL 1 3c Approvals 11 000 Fe r les D esel Box 120-T West Engle-wood, New Je sey

00 OLD US State a between 1841 and 1975 \$ 00 R with States. \$1 Chestnut, Mainted Ohio

TRADE your duplicates toward our appr vals Detain free Variety Stamps, Box of T New in H s ands \$1 Mass

100 DIFFERENT Worldw de 10c with antrova a These are barnans' Send lo-day Smith, 6 Greencroit, Champaign, 7 Londa

PREE United States I extrated Catalog B S 45 BromSeid, Boston S, Massa-

FREE-Mint British Colonies from North Borneo, Caymans, Beycheiles, Dominica, Papua, New Guinea, Sarawak, Brunei, Free with approvals, Viking, Great Neck

5. New York.

PENNY Approvals jammed with Bergans For better values try Pulnam.
Stamp Company, Mahopae, New York

HYDERABAD, Nyassaland Pakistan Selangor Bulgapore Free Unusual Inexpensive Approvals Accompany Nade 5, Box 2.18, Philadelphia 3, Penns) Ivania

PREE everything Free-Mammoth rolbection cataloguing \$20.00 also 50 valuable
templete sets 54 Gigantic multirulor Commemoratives All vilumes Scott's International Abums, calalogues even Master
Global Abums, Pree when you bu our
sensations, foreign approvals, Hargain
Stamps, Redlands California.

TOPS' Free book, "Row To Collect Starting Send for your coup today" Apployers Littleton Stamp Co., Littleton E2. N H

1000 DIFFERENT Worldwide Stamps 81 90 Valued Gier \$20 00 Universal Bux 6 Kenosba 6 Wiscopain

100 DIPPERENT US Stamps 25c Vet-Fran Fin & Stroakev 221 Market St Perth Amiany New Jersey

PRIE' is Mint French Colonies Interesting Approvals Accompany, Tropleans, But 634 S. Oakland Park Fla-

PENNY to 25c worldwide approvals Sunny o high Princeton, Memphis 17 Tennessee

100 DIFFERENT Austr a 10c Aperirals Ityme Aronson But P Newton Centre 50 Massachusetts

Old scarce U S seconds on approval Signally defective, bargain prices. Bearnfeed Chattonhol Station. Newart 6, N J

but do our court of the state of the detry by country Only 50c weekly Free detalls, L. O. Ware, Stephey 20, Coun

U.S. Mint Plan Set. \$1.00 Free Price Last Brooks, 2325P Avenue X Brooklyn

VIET Nam 75 D Serent or 17 8 90 C K Sampa 92.2 Sheridan Road. Renosha Wisconsin.

Kingsb.cv Stamps, Fairfax, Vermont.

UNITED States Cate of Free! Bailey Stamos 45 Bromfield, Boston S. Massa-chusetts

Blamps, Romine Ave., Pitteburgh 26

EXCEPTIONAL 125 different rais did \$1.00 includes to a gles commercial es 10c acp avais Reeves. Non 597P. Mismi 37 Fb .da

PRFS Assertment Worldwide Stamps. Bobus Offer Approvate Hobby, Box 1718, Newark , HJ

PREE San Marino Mozambique Czechoslovakia A stin in A gert in Appr a i May Box 800 D Cota, Onbies 16 Funda

CANADA, 100 different 350 with bargain approvals. R. S. Honnes, London, Canada

4 DIFFERENT Comparis Sets 10c To Approval Applicants, Caribbean, Box 266, Mismi 45, Florida.

SPUTNIK, World's first Space Satellite stamp and 50 different, all free with excellent approvate Stamp Imports, Peter-boro, Ontario, Canada

60 DIFFERENT U.S. including 30 Commemoral ses 38c. No approvata Beldet berg. Appeton. Wiscones.

PREE 103 Worldwide Stamp Assortment Approvant Send dime for his ding Lipatamp Bt Californies 4.8 Onto 10

TEN Sports plus 60 Different, 10c with approvad. Bennett, Candor 2, N. Y.

1000 DIFFERENT, Worldwide, with approves Jacobsen, 6395 P Broadway New York 40 N Y

BRITISH Colonies, 108 Different 15e also Free Albums, Cala.ogs for Purchas-,ng Approvals, Coast, P.O. 2187M, Santa Ana, California.

NOT every stamp but most of the good US and foreign on approval Lackeds Stamps 1973A Coumbia St Louis 9 Mo

1000 a PREE With Purchases Approvals.

21 DIFFERENT Commemoratives 1403 up 10c to 8 Approvata K & B. Box 70 Brook vn 21 New York

160 DIFFERENT stamps from countries of Austria, Ne'herlands, Ital Hungary British Cosor, es South America tiermany Czechoslovak a Bengum Canada. France, Spain, with Approvals 20. — William C. Jenks, 2557 Wendell, Detroji S. Mich.

COMPLETE United States 1949-30-51, regular 89c, now 29c, famous Americana, regular 82 85, now \$1.75. Presidentials regular 87 35 now \$1.45 Peterson, 400 Empire Bank, St. Paul 1, Minn.

n Antiques, regics a

SPLLING 100 000 ancient Arrowheads. Spearheads, Tunahawks, etc. List free-Lear's, Greewood, Arkanias.

Tomahans 10 00 List .9c, Stams, .854

SCALPING Enife 3 War Arrowheads 87 00 Catalog Free, Arrowhead, Girnwood, A Landar

MINERALS & PRECIOUS STONES

EAPTH Science Rockhounds National Maguz e Subset often \$2.00 Sample 35c Sex 135. PS Change (10 In

LARGEST gem and mineral magazine tells how to have profitable fun with take gems, levely M 11 i \$1.00 tent Sample 25c Gems & Minerals Dept B-5. Mer time Californa

GEMSTONES To rev Cocut \$3.50.50 M seras \$5.00 Specurens to ting Material Lists Reed a 4930A Passallo, SE, A buquerque New Mes. C.

GEMCLTTING - S sereraft magazine Learn to cut gems trake jewests. Ada give son ralequi, me t gems for custers on the loss. Free leratule Sample - y 25c. La idery Journal De, Mar J. Ca. free a

SAPPH'RE Topax tourms no garrat.

period Five and S gents & 00 Bangain
list Gents Jenery mountains 25c Comm

alling equities t 25c O Briefs \$ 11.6N

Wood St wood 30 Conf

ROUGHOUNDS Vist the reflectors paradise Crivial Pres - Recitioned Weight I

II HOBBIES, COLLECTING

INVENTING can be an interesting and problem in but Write for complete parallel sare lines at the of American I set lies Dept 30-E 635 P St N W Washington 4 D C

CAN you find use for Amazing Kinetic Lum revier of Baffles us? Working model 42 Passibating Grass Products Sonoma.

COLORPUL State Bouvenir Decais Last 10c Hot 504 N sch L N Y

Pick E listing in hobby directory Send. Dame add est and hobby Page Box 212 Rechmond Virginia

to NEW m. that thousander patches 2 bebots is under in the heart Post and \$1.00 N. M. minel 10636 Chertot Dr. Lan Augeles 64. Ca. Horola

CIVIL War Soldiers for the Dioramist 32 Blustrated Pages, Catalog \$10-E 25c Bussier Miniatures, 40 Hown St., Quincy 60 Mass

COLLECTORS Matchbook covers 100 Different unused 5, 00 Ca's at 25' A burn 83 00. Charles Edelman, 131, P East 84 Cere and 5 Obio

TEXTILE Paints y 12 decorative precut stenctis \$1.00 Catalog 300 dealghs, 250 —Dog Bever Art Service, Box 334, Huntington Station, New York.

PROTO PINISHING, PROTOCOPIES, ETC.

PARTICULARY & Jumbes 40c 12 50c Size as Jumb M expet 25 1 tro GTer Plant Folio Box Mill Brooking &

PRES 5x7 Introductory entargement with role Finest que in Jumbo de ed parte in band super parts & excess re la 12 55c Consiste r at prices in Big Discipate Wile cell be Photo Dept PH Bix 1506 St Paul Mannesona

REPRINTS 30 for \$1.00 thru May Stat. Twelve Exp. 30c. Wallets 29 for \$1.00 Lincoln Studies, Dept. L. Box 13. Libeotu.

FAST F in Service Black and White Eight Explaine 40r 12 Explaine 60r 25 Explaine \$1.00 Reprints Sc Knds nor Princes 80c Prints 32c cach Absolutione Fain brome \$ 40 Kodarhrome 2 50 Id a ted Finest quality (ser 40 years Mailers Mai Order Photo Service, Box 297 Watertown Wascous P

Host R service on defuse Jumbo prints
Exposure 70d Greenped and # jumbo
pri to 60e 12 exposure 55e 16 exposure
10c 35 mm 70 exposure 75e 36 exposure
\$, 25 Jumbo Deckiedse Reprints & each
Contact prints inside if specified Buy
Photo Service, P. O. Box 2.0 Oakland.
Ca. forms

PREE Cruor Print Coupon with Skinchrisme A acorbi and Pricessia 8 00
E daibr and \$4.25 Write for Malers
Natural Color Corporation, Box 12 Sal.
Assault 5 Ga Box 8350E. Chicago 80

KODACHROME Processing 20 exposure 20mm ro. movie \$1.00 A seachrome Extacrime \$1.00 Prec matters and price lit Nu-Ci or Laboratories. Box 19. Hartford I Connecticut

PREZ Color Snapshot Folder Offers, Lists. Maners. Houghtons, Erving Mass. KODACOLOR Film Processed, 90c Frints 12c 25 per cent discount with this advertisement Maylair Photos, Box 817-8, Turedo 1 Obto

33 MOTION PICTURES, STIDES SOUND EQUIPMENT

MOVIE Camera Film 8 mm roll \$1.50. 18mm 100 \$.00 Pree processing Better Pilms 742 New Lots, Brook, n. N. Y.

SAVE 50 . ' Quaranteed fresh color barw movie film anim. 18mm Free rations! Eso H. 47th Homy Kames City 12 Mo.

FREE catalog Save 345 Fresh Smm, 160:m B&W and court 0 m Home prices a equipment Superior Bak Film Company, 442-448 No. Wells, Chicago 10. RECORDERS 18 Ft Free catalogue. Caracone 2 5 E 50 St., NYC 28

TAPE reserters hi fi components layer U about yourse Pres Catalog Dressuer, 49 04 174 Street Plushing 85. New York

PRFE Cave space 5 000 & 16MM Pitms Interpations, Publi Greenvale New York

BARGAINS 16/MM Sound Films. Clossouts BML Lists. Film Enterprises, Box -23. Hagerstown, Maryland

MICHACAN co or sides Free catalog H sentra Box 56PS, You and Michigan.

SMM Martes 50 ft 8, 00—special Offer At aroula Cartinona, Travel, Con edits Send 5 00 M are and Finns Inc 18121-8 beerman Was Van Nats, Casti

At M M Sound Features and aborts. Reason abse Bedner, \$300 So. Talman,

Duque le P . S w P to burg Mass.

M CAMERAS, PHOTO SUPPLIES

PREE Free Send for your new 72 page Pluding apt r Bargain Block Over 5 old new and used ems at ruge savings For your Free Bargain Block arts to Dept 45 Central Camera Cu 230 S Wabash, Chicaga 4

PHOTOXICAPHY For Pleasure or profit Lead, at hime Pract, at hade train a Long ratablished ashiel 7 see booket A rries. Set of of Photography, \$35 Diversey Parkney Dett 1725, Chicago 14.

15 MM Camera Hy famed German Cra smen Order from Importer and save. 5s othwestern Trader, 1308-F Booth Dartagton, Tussa 12. Okishoma.

Finto Equipment, Appliances Free Catsloy Mailars, Box 135-PS-5, Pelham, New York.

SONG WHITERS & RECORDS

WANTED Poems for must al settings write Surgeriters Service, Culton, N. J. Sunt Pokes and lyrics wanted. Mail to T. Lan Ades Ind., 1600 Broadway, New York 10 N. Y.

SONG poems wanted. Free examination. Send Poems. McNetl, Master of Music, 1112-PS Wilshire, Santa Monica, California.

ACCORDIONS Wholesale—10 day trial. Pier (als a Ameria A cordion Center 5 3) Ph 5 Belmoi t Chi ago

PORMS Wented for New Songs and Recording Immediate Consideration, Send Pens Songcrafters, Box 6145, Ackles Statum, Nast v. v. Tetm

State, Whithers Record of Company We to new mage Role in basis Net stall sales of the selected. No charge for me dies Send material. Music Makers. Dept. G-15. Box 2007, Hollywood, California.

COMPLETE Music Service For Song Writers, Jerry Columns, Bog 8889, Bur-

SONOWRITERS' Dreams Realized, Detales 25c Oleon C. Buechly, P. O. Box 12. Piqua, Ohio

YOUR Songs Arranged, Recorded for Publishers Presentation Vance Studio-D 3409 Grand Avenue, Oakiand 10, Call-Joints

SONOS Into \$55555 Share \$31 million do are yearly for New Bongwriters Bong-piets Ary subject songs composed published promoted by lateral firm Information appraisa Pres Send Nordyke M sic Publishers. 2000 Sunset, Hollywood 25PS. California.

POEMS wanted for new songs Send poems Free examination Crown Music Company 49-P West 13 Street, New York Cuty I

TUNE Your Own Plano Tools and the structions including Tu he wrench so is. Nearon Co. Bux 101 G. coy Calif.

PHONOX RAPH Records thesp, postpaid Calaiogue Paramount, Box 243 5, Wildemaport Penns ELECTRIC Guitars, amplifiers, wholeness Free catalog, Carvin, PSM, Covins, Captorina

MAGAZINE, old rare phonograph records, 24 pages 6 introduction as as \$1.00 Record Research, 121 Hart, Brucklyn 6, New York

BONG WRITERS' Protect your ideas' Brid a poems songs Write for safe correct procedure Song Service, Dept. PS. 223 W 56 in New Y rk .0

STPPLIES & EQUIPMENT

FILE Client Bargain Cutacog Tranmator Su., Rad a K a Portub es A dio, E extendiad. Protog autist Ou s Tana Housefuld Write Let in 1918 Eve ett Ave i ensen. Massac upe ta

GUARANTEED Recording Tape, 1300 — \$1.30 1400 \$1.00 2400 \$1.00 On T Hera Empires 77 -35c M in im order asserted to Banmar, Box 205 Biommand. New Jersey

Determ a finder S soperar pes Pa a beine Reflectura Amain's Parara Catalog - De Mestina, Mandett 68 Mass

CRYSTAL-Radio experimenters Write to Huset 305 Nope Laborated New Jersey

3 D Effect obtained for Hi Pi music asstems at minimum out hi feveror a in the id for free descriptor finde C ton Company Deat Tie, 7863 Maskella Ave. Val. N. S. Ca. f.

RAD O Course on v 627 85 Lock des ad labes, parts Local distraction W e for full information Progress so Edu K to Inc., Dept. 556A, 467 Union Ave. Bruss-lyn 11. N. Y.

CHANNEL B g door television abter a Ha door p and bound Talst of knob extends steel tapes for best results on desired channel. Sold everywhere \$9 15 Special Send \$5 95. Satisfaction or refund ten days. Earle, \$1 Pleasant \$1., Norwood.

gyeltyBODY's Tube and Set Tester. Complete Ten Dolla : 1 - re Free Stegatronics, Colches er. Councettout.

27 BUSINESS OFFORTE NITTES

OPERATE profitable mall order buts bean Wr a Waster service, \$100 B Suct.

P. K. T. Den. ore Incornance home course true on Paroury he of From St. M. let W. to, Paperscher Lassinian 2, Pauli-

Will trackle that the by medandar part are and when Tyle. 7 & Gr. a. a. to as example the first and a Save half Lorentum Free Assumed Wareness a Service, 1918-C Starr, Butpingles I am

and WEFELLY—Home, spare time. S mplified mal. bookkeeping. Immediate income—easy: Auditax. 34757D. Los Angeles 14

11,000 NEW Prospects Daily. Baby record books, shoes, albums Sell mallorder tos our literature. Write. No-Co-Ro. Capitola, California.

YOUR envelopes addressed accurately passonably Fast service. We have ca, absordereasets in your city Gleman System, Box \$562, Chronand 1, Ohio.

BRUSH Plating Outsite for plating arficles in the home and shop. No tanks terressed by the Martors are of fair time Pres on a same trummetal Co Ave. B. Decatur 1 mosts

Earn at home with new fast a .e F : ting method. 85 sta ta and new door over the Free (- nde ' a. Fa ta a. d. Va. abort Samples Street, P. 11 MY Los August 61

Tree R Own name brand business No investment no a sentory Part time or further time of a name of time
MFTALIZE Baby Sc we Repair Dona Rebuild Entiries Co a que 15 ideas Free, Universal, Bus 1076-E. Fouria. Lui-

LTARN Photo Negative Portrait retouching Men, Women så hour possible spare of full time at home. Easy game oroug, Work for Photogra hers by malorier Pin details sent Free Dural, 100 Bouth Vermont, Los Angeles 4.

BE appointed state notary public now.

Proble Import Man Order Bus ness-Import profitable items beam we assale E perfence and product is restment or necessary Ptds space time Particle word trader to dealing Pres at 15° amount details Member P-605. Lan Angeles 24. MAIL Order—advertising agency executive reveals seems some no risk advertising and merchander methods filter in office or historical image capital pusitive pricts free details impact 340° Fronpect Ave. Dept. 2.5 Cieveland 15 Onio

PREE Catalog Contains hundreds of bus essen, in me and income properties if ough out U.S. Canada Specify type and Location desired Deal direct with owners U.I. Buyers Digest. 1808 R. - burst Dept PS 1 Los Angeles 21 Ca II

LET Me Sell Tour Products Nationa vil Send You Pree Information On How To Establish Sparetime—P. Time Case with Business You Build We Send Received Supposed Abacel. 801-Wt. Suited Lon Argues 78

16 NEW Home-Business Ideas Book let samule Free Borne er in Venet-Suede or, anything Floritaraft MY Los Angeles 6

GROW Orrhids at home Profitable fast cinating houses a home grower established appeals light temperature and humidury conditions orrhids need Present details, Orrhids 100 & Verspont, Los Angues 4

WANTED Lize ted p mber inteligent Men and Wante to a rea a, home or each a district order Business a specific but he e a real real e e til re i ud lig e et le cames addresses about and a lo i en i for you Proe De a is May for der Describution MY (Franchise Divine) Los Algres 6;

Me one Pulk Master Mrs \$3 500' Pree Borret J va Plan Magica Work bome Pub 5 M13 Organiside Calif

PLASTERCRAFT molds. liquid rubber, plasters fi she carde supples Carde supples Carde Rapids Rapids Eansas

LEARN Ma birder Boiling Pa t Big Free Court Reprint Louist, 240 B W Jackson Chicago &

MARY Money Writing Short Paragraphs. Infactation Pres Barrett, Dept. CH 20. 7444 N c ark Chirago 26

IMPRORY Ms Order Business New Directory astrover 400 mar is fators expended to a of the whird Care e.e. tracel and apply pasetheds Cap a universal to be detain Administrated Bus. So Fo Bur. given I tra

CIPTURET NITY to earn \$15 000 \$10 000 Bit in a Practical price ted to at the control of the standard of the control of the con

VENIX N 1 Machines No Se ing Operate A Route of Coin Machines And Farn Arasing Profits, 32-Page Catalog Free Paraway Ma no f regratery Empt 5

PRIE pi ture folder. H. w. lo Make 33 000 Year v. S. e. etter Back and Rass i.e. Earthworms. Outhores 42 Cedar H. S. Ten

MINE Rates g 1 format in free Complete Sake S per f Mini Parm. Super w E E5 Wis-orner

shift a is if Misinture Porest or orcha d or s in set by a stat bea's taste t r from at home from an analy from f of set of Fast rating h bbs. Profession H me B uness (high that a Free Seeds a d P'on State your age) M a re Notes on Dont MV sarde a Califor a

ATART Home Mai Green Business We St. Mrs. og P., V. S. Unders - Ci de trus W. or Romers 2014B Pannayata & A. C. Crarlesson, W. Va.

INVINIBLE Remember \$5 in one hour point ble remember but to learn moth it as Bus a hu, time Fire lie at a his Wrane Dept C 135, 335 W Medison C', ago 6

r ROW Expensive herbs for us. Sigor " a home business of your pain Tear are oil profit to We sup it everyths a herman's Se al for free rare seems and ferra & pain State out age Natural He b Exchange Dept MY Oardena Calllot a

100 - PROPIT No Investment Stamp brings details samples. Miller, Box 584. Brooklyn 1. New York.

CAMERA overest Rain 250 weekends! Instructions 21 00 Information free Kinse 235 PM North Austin Charago 51 Lagrous

STEADY home income stending simble management Past east process We start you Co-art. Hi Crombbite Denvice. It man

ACTOMATIC Saw Plung -East rash at home Price book to as how Charam M. F. er Co. Cotombia His. Mann.

TELL, Wholesale! Appliances, housewares, jewelry, etc. Individuals or retailers Free details. Davis, 1305 Paul, Marfolk

QUICE profits, with no empital? Take weets for magazines your regulous like, want blake rash on the spot We show how with Free kt Oct yours now Write M tiregor Magazine Agency, Dept. 240, Mount Motris, In

BELOW Wholesale Catalog, instructions 25c, Seegay, Box 19126, San Antonio, Trans

\$250 WEEK reported! Free book "505 Odd Successful B amesses Work horse! Expect something Odd! Pacific-30C, Oceanside United to

PREE Literature Make Big Money Resid Fit is the and Crickets Carter Farm Piatra Ca

EARN 5 0 000 Yearly Raising Angore Rabbit Woot for La Ir o ha ich 250 Cost. American Angora Company Maria I Mortana

NATURAL M ding Rubber, Extra True Free Sam, is W. Wooley, 1916-B Donald Poor a Lucole

WANTED Men Wamen raise ball for 184 at home Pu apare time Diera; I take the space. We furnish everything Balt Associates, Dept. M-11, Stetson, Maine,

M mT exist of sound moderate capital for moderate dynamic Hundreds surressful For details, proof, we to Erol hauer, 304 W Eighth, Los Angeles 14 Cabi

MARCE Estra Money Cash commusa one Ever tody burn ener to sell Adve sing Road Matrice Ly, n sales Signature to amout to She take to a the community of the tra R busies Powers house se ding til Free Stead repeat business No experient Match Company Dept PX 538, 7538 & Catesting and Catesting of the land of the community of the land of the community of the land of the categories of the land
MAII PROPER Laws and Regulations and Mainther Hules for Begulate attachment increasing premise different lairs one requirements, of Bert books, \$2.00 Tasker But 2.21 Assunding, Va.

CO Publish Mail Baie Advertiser seading mair order paper Details safest copy Lone F Baies (ressons Petris learns

MARKETS Everywhere Make Artistle critizets briths a pottery C emical resort of a History and Center Straff. 8 2° P Winder-land H. whiled 66 Caufor in

CANL PD Pursorn and Putato Chip Eq one t Basine Box 923 56, Spring-field (1939)

NIG in ner sepairing and annes Comple a rairse sen allust arions 12 5 M ev back marantes Scott. Box 200, Grat Neck N Y

200 000 MONEYMAKING Write Charles R. Williams, Route 2, Clarksville, Ten-

INCOME from local information No

TREMENDOUS possibilities in mail order I retired after five years. Write N Cole. 317 West 49th, Bradenton, Florida

Complete setup service—not just instructions. Hermes, 152-R, 42, New York City M.

FREE "Franchise Profit Letter" describes nationwide opportunities. Excluter describe certip describes agency operations. Write today National Pranchise Reports, 135 North Michigan. Chicaso 1.

TMPORT Without Capital Amexing New Guide Tells How Beginners Guiden to the last Free. Victor Publications, Box 644 A Kingsport Tennessee.

1 kg D Rubber Make Scalbie molds. Free Sam le Chancy, 1967-C East Rd., Jackson v. w [1] Fra

MAKE 2700 00 Morthly Stare Time With Jigsaw Free Letails Famon, 366 M Numer t Shoul Fa to 6 Dek

CASH from Sawdust, Tin-cans, Newsbearts Over 200 methods. Instructions 4 06 Charles Company 13-XBO Norwood Ot to

\$100 00 WEEGLY Start foors Raise redworms soldess way Oderseas Charlie Morgan, Box 116C Bust nell, Florida

WE Pay \$3.50 b dried Grow Mushroums Celiar shed and outdoors figure for time ear round We have 25.000 customers Pres Book Washingt n Mahro m Ind Dept 178 2554 Admirst Way bratter Wash

MAKE Sexible molds Cast planues Fg. uti ses Free sample Tooker, 1045-A Pair-

614 76 TWO Hours Manufacturing Ne Se is Cariaro Castings, 1803 Pressont, Ray 6 City So Dakota

TURN newspaper clippings into surefire ar less Instructions 1 00 Associated activities. Box 279, No. Mismi, Plorida

OPERATE profitable mahorder builness Write Bund, 1637-R West Vernon, Process, Arizona. DEPRENSION booms strange, cheap, ! DOLLARS Every Day! Amazing Magic building plastics. Easily made anywhere Majorder Plan. Setup Proc. Miller. Box Enormous profits Exclusive territory Bays 1888-A. Ochkoch. Wisconsin.

Laboratory Arkanasa City Kamasa

PREE Poho \$5 000 645 000. Unimited Vacations." No merchandise U to an Work home! Mayings—S-16. Cartabad. Cruit

PIANO Tuning learned quickly at home Tremendous field! Musical knowledge un-hecessary lpfo matter free Empire School of Poster Treing Champaign, Lainess (Founded 1835)

\$250 WEEK cleaning venetian binds Patented Machinery Free aterature Rub-lason 7213A Indianapoids I Indiana

STOP Wrinkles. Mystic Secret \$2. In-Struct Others Details Erbeids Gardiner

BUY Direct From Pactories- App lances, Company 85,0PS 20th Ave , Brooklyn 4,

SELL Books By Mail. 400% Front.

TYPISTS Up milled Profits Home B. siness Juan Studio 1-A. P.O. Box 3051. Chicago 54, 11 mula

START profitable home mimeographing pervice! Our exclude secret plans from how Write Moseum Mimeo Shop. Bonham J. Tekas

YOUR Product, Liquid or Solid, Filled in Bottles of Cana. Only few cents per unit. Am Chemical Company, 143 Verona Avenue, Nework 4, New Jersey

COLOROLAZED Concrete pottery made without in de Patented method Ceme tery products, noverties tiles Basement leak seading Money making priects Bookiet details free Men only No man Potier es cirand Rapids Minnesota

MAKE New Orenseises Doughnuts In Etchen Sen stores Free rectues S Ray 2605 South 15th Manneapouts 7 Mannesota

100 000 MILES Without a Major Repair Auto Miracle saves gas of Ciran up taking orders Samule sert on approve of Send name address, make and trait of car Magna Power PB 2 W 25th Baltimore is Md

MAKE 846 From Square Foot Piswood Jiganw necessary Pres Determ. Woodarts. Bridgewater Mass

MAKE \$50 000 Yearly From Some Informative P and Free Fortune Enterprises.

AMAZING Profits making concrete drain the in your backward or garage a th shexpensive oute ted machine frend) market No expensive needed idea, a aretime business Costen Products, Dept. DS, Cor-Jimush. Cen.

MARK Big Profits a spoing newspaper stems for publishers linetry tions day age how Part cours free National, Ba-R Kuckerbucker Station New York

MONET WAKENG OPPORTURITIES

BELL Tilania Gems for more brilliant than diamonds Calaing 10. Diamonte 2420 B 7 th Oakland & Canforda

DFTECTIVES-Work home-Travel Ex-pertence onnecessor: Detective Particu-lars free Write Wagoner F-125 West 86th New York 24

\$. 000 00 MONTHLY for 27 Years Stay home and enter He with most fuscinating ma jurder business ever cor eixed Matt-mag has put over \$250 000 000 into one matibox under this pian Learn how you too can start new Free facts Britiness Specia ties Box 2065. Daily City Casif

BUY Wholessiel 26 80% Discounts
Appriances, Gits Typewriters Tools
Walles Sporting Goods Jewery Cumeras Housewares, etc Conscideted Distributors, Cifton 14 New Jersey

SPARETIME Repeat Profits Taking Magazine Subscrip on Special Offers Cassell Agency Bounton Beach 7 Florida

VENDING Machines-No Selling, Oper-Ate & Route of Coin Machines And Farm Ameting Fronts. 32-Page Catar & Free Fartway Machine Corporation, Dept. 19 715 Ensor Street, Baltimore 2, Maryland

HOTTEST Mat. Order Plan Ever' Sell ph ton 5 ms art nove the Huge proven profits' Pres Details' Profits Un mited Dept. 21 15045 Ventura Bivd. Sherman Oaks Calli

MAKE Money Writing Short Para-eraphal No tedious atudy I tell you what to write, where and how to sell and supply list of editors buy on from beginners Many small thecks add up quick y Write to sell right away Bend for free facts Benson Barrett, Dept C88-R, 7464 Clark. Chicago 26

STEADY home income stenciting sim-ple monograms. Fast, easy process We start you. Co-art, 111 Cronkhite, Danville, likeois.

MFN - Women' Steam Money Making Plastic Lain, at og Business at home in spare line Material that costs lic brings back \$2.38 No canvassing or selling but mail orders bring in \$20 a day Write for ful part mars Pree Rush name of post card to Warner Room CL-3 D 15:1 Jar-9:8 Ch-cago 26, Ill

SHELLCRAFT Supplies Highest quality Lovest prices La gr Celandur f Pace s Box 279. Bradenton 4, Fiorida

IMPORT for profit and pleasure 100 foreign dealers plus importing the Main samules \$2.00 Seegas Bus 10.26 San At turns Teams

200 WANTED Inventions and How to Invent Them. Details free Maria Com-pany Box 916 C Evanation Indiana

RECHROMING hit for automobiles Dis-ir bulors walled Pairmont Chemical East Sincuse N V

NEW Plants: Pibergias Process opens up By Opportunities for Home Operators New Manua, shiws how to embed real flowers butterflee obolos, advertising specia (les is right liquid plastic and sell at hig prints field 25c Castolite, Dept DO- 02 Woodstock 31 mots

PENS and Ref. s Wholesale Transer. PO Son 118 8 Rockford III

PREE Literature-Make Big Money Hausing Pishworms and Crickets, Carter Parm II Plants Ca.

MONTYMAKING Coportunities

I received 250 different moneymaking opportur ties in my mail. Almost any type m neymaking opportunity Pull or Part time "Opportunity Analysis Brochure" (copyright) 21 00. Arthur Dolan, 171 An-ni skemunnica Rd., Sabylon, N T

AMAZING successes through franchises Become exclusive franchise holder your territory information rushed National Franchise Reports 333 North Michigan

MAIL-Order Beginner's Manual, inva-sources etc 25c. Gavin, Box 767, Troy,

COLD " S Mint pass \$35 on ounce Learn testing by ing of point Com sets course \$3 from Davis. Box 777 Phoenia

START or extend non Mail Order Bust pers se ing Shows Insole Busts Ear asive territory basis Import direct Sam is calate size; il Tribe electrical propert es basis him of feet or miner returned Can also offer plastic sandais shore Rhingsion or derwear Lycenter Limited. Wisbeth England

WE Pay \$7.50 % deted Grow Mush-rooms Celtar shed and outdoors Spare full time west found We have 25.000 customers Pres Book Washington Mush-room ind Dept 179 2054 Admiral Way Seattle Wash

INCOME Lagring? Reach vote full earning power. Use this book. Surress Through Leadership your guide to ad you ement to be a new and industry. \$1.50 postpaid Perp sen Publications. Box \$25 Cariga Park Ca Hornia

WASE more money without extra work by avoid a common losses hidden rosts in day's fatter. New guidebook to a how \$1.00 information free Stary Pub nations. 19 D Brooks B dg Ann Arbor Mich

IF you need add tions income then you need this book. How you can make more miner by mail! Price \$1.50 Prid Salls faction distanced. The Carteria 10.01 Central Park Ave. Dept. PS5 Chicago 43 Illanota

PART Profits the Easy Way Make and sell costume jewelry Delails free! Write Modern Craft Box 11048-FP 5t Pelers-borg 13 Fiorida

SENSATIONAL summer mores maker! Miles Tite positio care 4 bri tant coldrink bottles Pain or imprinted Per sonalized or bus ness Pree sam les de-tais Take orders at once! Heman Elv-Jr Box 42 Langester Ellistic

PROORFSSILK Mail Trade Has Many Mores met or Occordanties Samole 25c Donovan. 29 PS Greenheit Levittown

\$15 000 PROFIT in one year possible investing \$5.00 weekly! Respectable field Method of purchase guarantees 15" profit No advertis e inventory selling or ex-perience necessary Complete defailed Plan only \$1.00— Selisfacts of Guerar leed Columbia Enferorises \$207 PS. Grubb Road S. ver Spring Mars and

JOYN the Prosperity Parade with a Mail Order Bookship in Your Own Hime Valcations 3974 & Milwaukee Chicago 41 Ill.

RETIRE Quick With Plenty I did Mail \$1 Capt. Wes. Lewis, Box, Tampa 9. Fig.

DISTRIBUTORSHIP Openings Available Fascinating Monetmaking Mening Business Powell s. Bx-363, Portsmouth, Vargarusk

PREE Polio ' 45 000 245 000 Un imited Vacasiona No mer and se Unknown' Work home: Hayangs-Sif. Carabad. Ca I

\$30 \$60 WEFKLY systetime addressing ente uses to g or handa, ing instructions is refundable. Hers, 210 Frith Ave., Suite 1102-8, New York 10.

TYPISTS Make Money at Home' Mailers 3 Madason Greencastie Indiana

SECURE paying bomework Sources esser't a facin vapp ed 50c Peterson a. 6030 M East 16th Des Moines 13 Jown

MAKE Money Clipping Newspaper Items For Publishers! Detained plan, Newscraft, PS 56. E. Man. C. umbus 5 Ohio

MAKE Money, operating Mail Order Business card brokerage Vosacek Printing 4444PS Utc. San Diego 17, Calli

150 00 WEEKLY Possible mailing cat-slogs. Ros 1611 Gregory Chicago 40 1.1 UNBELIEVABLE Profits Make Plantic Plants from thexpensive kits Prec Infor-mation Arjayco, 1404 Hayden, Cleveland 13. Ohio.

PORMITA for printing photographs on ties, searly, leather, etc. No photographic equipment necessary Send \$1.00 Frank in Studio. Dept. 1, 2033 Muskegon Ave. Ct I ago 40

PRFR 4 000 Word Report On New De-pression-print Business Opportunities Fortune Enterprises Addison, Librota

MAKE By Profits clipping hewspaper stems for publishers instructions expansion how Particulars from No 12 As. \$1-16 E. kerbisker Station, New York

\$15.00 WEEKLY addressing envelopes instructions \$1.00 Refundable Adservice. Spring Valley New York

NPW 7'x11" signs—Comedy Ret glous, general To retail for Catalog Free 15 samples \$1.00 Lowy, \$13 Broadway Dept 8 8, New Y (L 3

BUY IT WHOLESALE

LARGEST Wherease Supply Source In U.S. Get 23 free rate as Pura ture nothing applier at auto and accesso-ries farm equipment tools housewares hobby supplies. Free details Associated Wholesalers, Box \$2-C, Burlington, lowe

B.O Multicolor Wholesaid Catalog Housewares appliances Unit ing at rer-nare contrare higher blood are ra-dis photographs cameras recorders priectors topewriters, shavers, sporting goods tors tools sewing machines watches jewelry Name brands. Hise discrete its Postcard Section. Decater 188. Hartie di

WHOLESALE Price List Free! Rave 50 A lances Cameras Sporting Goods Hussewares, Hardware Jewelry Castholig O fts, etc Buy-Rate, Hawthorne 54 New Jersey

Birry Who scale! 25 000 Nat onally Advertised Products Cet Amaring Design Cata and Companie Delada Pres American Wholesaiers, 1841 O Leves, Dalas 7

5 WHOLESALE Bargain Price Catalogs
During the year Clothing for entire family Sheets. Basokets. I well it trhenware Drug Sundries. Jewesty Notions
Appliances Luggage. Vitamins Toys Nov
elites. Pans. Gift items Watches Clocks
School Suprites Toys Color Teteristics
School Suprites Toys Color Teteristics
School Suprites Toys Color Teteristics
Radios Righ Fidelity Phonographs Significants to Toys Over Mod Sense: Discounts to Toys Right \$1.00 decests refus dable Brochm Products. P-2549 North 12th
Street Manuakee & Wisconsin Street Mawaukee & Wisconson

Biry Vitamina Wholesale! Free Catalog V to Best 48" SV Broadway New York WHOLESALR! Appliances, tools jew-i-ry etc Pree catalogs! United Wholesalers 1265 P Broadway New York 1 N Y

ELECTRIC Gulture amplifiers wholesale. Free catalog Carvin, PSW, Covins Ca of rilla

FORMULAS, PLANS, ETC.

PORMULAS—All kinds Latest products Literature free Kemico, Park Ridge 13. Ill

LATE Modern Manufacturing Formulas List Pree. Chemical Service, Mariville, New York.

FORMULAS Thousands authentic Lists. valuable information free Brockway, Gage Building Topeka, Kanasa

50 PORMILAS for home and auto-00 Formulas 5400 North 40 Street, M.lwaukee F, Wisc

PLASTICS.

LAMINATING Supplies Price List Free. Solomson, 46 Cornhill, Boston 8, Mass.

LEARN Plaster Patricution For more than dicuste Low read home training now available Write for free booker Interstate Training Service, Dept. D-2. Portland 13 Oregon.

NEW Liquid Casting Plastic clear colors Embed res flowers toins photos few Manual shows fine things you can wake at home and sell at big profit Send lite Castolita. Dupt. E-thi. Woodslang

PLEXICLAS Accepts. Vinship priventer Piperpias Louis Structuum mold materiais 28 Page natructuses format ve Thomasse-retail catalog, 25c. Gem-O Lite, \$327 Car orage North Hollywood Catt

PLASTICS: Casting, Molding, and Modring. Complete Outfits. Molds. Jewelry. Accessories. Send 25c for Catalog and Beautiful Plastic Novelty Castacraft C-rp., Dept. \$500, P.O. Box 555, Paio Alta, Ca. Jornia

PLEXI (LAS Square foot cost 1 16" 81 20 2" 8 32 3 6" 8 36 Chairs and 10 Bend 15", for postage Aristocrat Pleatics, 21 Square Avenue Nemark, N. J.

PLASTIC Tooling, Cast, Embed, Laminate. Ideas Into Deliars. Thousands of products easily made. Over 20 Materials. Leguid Fosm, Rubber, Aluminum, Ivory, Glass. Formulas, Manufacturing Methods, Mold Construction Included in Catalog Send 250—Gel, Box 241, Union, N J

41 CHEMISTRY & PHYSICS

il-LUSTRATED Catalog, Chemistry mineralogy, biology 25c. Tracey Laboratories, Evanston, Illinois,

CATALAN with 1800 the legions of legionature and patrates apparatus error for \$2.00 Feat; and labora re Materiaus Company 1328 E. H de Park Bord Charago 15 I)

PREE Schoorship Maler Crise in Chemistry Dictions Also salisable hemical thrary and others are Call or free National School of Chemistry Redwood City Calif

CHEMICALS in small quantities Chemically and Apparatus sets. 23th year Catelog 25c. John H. Wing, 124F West 21 Street, New York 11. H T.

EXPERIMENTERS Bargains Catalog, 25c (Refundable) Harmow Laboratories, 2414 Clarks Manitowoc, Wisconstn.

CHEMICALS and apparatus for Industrial, analytical and provide laboratories Catalog 25c Dept. M-36 Biological Supply Ca., 1176 Mt. Hope Ave. Rochester 28. N Y

PROOKLET'S Chemistry," "Physics,"
"Astronomy "Relativity"
Forty " Ratio 1 and Tables." "Mathematics, 10r Rach France,
3121 South Racine, Chicago 6

CHEMITATRY Science magazines Litersture free Lankish Bus 5:26-D16.

t HFM15TRY experiment set for pretpaid hits, 1463 Droke San Pable. Calllorida

CHEMICALS, Cleaswaye Cataning the Laboratory Sales, Box 181-E. Brighton Ma s

48 HELP WANTED REPORTS

AMERICAN Oversens Jobs. High Pay Men. Women. Transportation Paid, Free Information. Transportal, Dept. 2C, 200 West 16th 5t. New York h.

Principal 20 m Laire America Abacha Ca ada up to 8 500 mm l r Lo in date 15 d Portigo Berson D sctory a rea a migrate information had ut of Stine larging for 16 tars and Can an Constructs o Algerial Obs Exporters Importers Missing H w Wings Where to a project Missing H w Wings Where to a project Missing H w Angeles & Cauthornia

(v)PYRIGHTED Reports on heat partial tobs with trave, adventure prior to an Constructive arial was a sected abuse a cherical tender superstant laster in usua opposite from Many travel of with Barriel and a street for men and a street for a great action advent services are result included absolute vives Bureau articles, but a sala. See a shear the earliest from the services and a sala. See a shear the articles, South American observation and husband wife foreign tobs. Research Bervices, Buile \$14-PST Meramor Build-him St. Louis & Masouri

HIGH Paying Jobs. Opportunities, forrigh, USA All trades Companies pay fare For information write Dept STL, Marional Employment Information, 1830 Broad, Newark New Jersey

JOBS Oversess! Janecek Development Co., 180 Hub Station, New York 55, New York

JOBS in California. All ages! Heed hundreds of guards, unskilled luborers, incchanics, drivers, clerks, draftsmen, salesmen and many others. Home r or too \$300 to \$600 per menth. High \$2 to Batlafaction guaranteed or money refunded.) Personnel Consultants, high Channing Way, Berkeley, California.

monteworkings information. Number 128-P Eleventh, West Bood, Wis.

"U.S.A., Poreign John." Accurate reports. Job — apportunity information — 1. 66 At ton Reports, 135-2 Se. 12th St. San Jose, California.

JOBS on Merchant ships his pay Bec

SUCCESS impossible if you make any of three 13 errors. Actual Case Studies travers is a see that the same sees of the same sees that the same sees of the same

YOUR Abilities preded to booming California Industry Ail Side Feed \$ 80 for tear emparations. Her Services. Box 361 Oakland 4 Ca for ta

CALIFORNIA - Objection ties emples ment bossing informat in Scienta, report on similar a d business condition a Seni fit - Patro 65-1 W 10th Street, Dept S. Los Algres 62 Castl

PREE Information—USA Overseas Jobs. High Pay. Transportation—Putures Unlimited. Dept. P. 215 West 14th Street, New York City 1.

147 H Pay Oversens, 1958 Guide to Emple ment Ab. and Cateer contract g.r. ernment, private—Europe South America Pacific, Alaska—Stenographic, administrative, radio, teaching construction, travel, hotel—New leads from on-the-spot research — Transportation, housing paid — Send 31 00. Hill International Publications, Dept P. P. O. Box 229, Long Island City 1, New York

BRITISH Columbia. North America a last great frontier is under major development. Construction workers, truck drivers, clerks, oil workers, catalinners, loggers professionals, others, — request pertinent information before coming Write Opportunity News Service, SM, 1568, Relowns, B.C. Carada

TRUCK drivers, laborers, belows evaflamen, Classifieds mailed from Nor folk, Virginia's largest city \$1.00 Classis fied Adds, Bux 718, Norfolk 1, Va

CALIFORNIA Needs Skuled, Unskilled Man. Los Augeles, San Dieg, H. . . N. a. C. supplete lists 5 00 None a. Nonest od lists 5:00 (a struct mont \$40 Dec.own.

63 ALESTS WASTED

YOUR own business dutts \$1.50 Civerton a nor Machanaux 35c, Shore 12the Ladge Coats 30c Dresses 15c, Enormous of the Catalog Pree Hathan Portnov As making as 2160-J Rossevell Road, Chicago 6

ACLEN'S 100% profit salling genuine of a s of releters, stores and office for the Metallic Stan Letter Co. 1217-E West Newport, Chicago.

PRES Samplet Beautiful Peating Pictures. Sylvial. Apartado 9016, Mexico 1, D P

GOLD or allver letters, numbers, Windows, Doors, Trucks If to 8" \$00% Prof. is Free hamples Atlas U 544 West Tack i be age 20

1 FY \$10 000 arty for d root it on many far future tile wield over at lowest prices Make up to 1000 profit! Proc Literature tiess \$1 aced 6 to 11 Pa.

COLDMINE of 600 money-makers. Free coor 5. e. alty Salesman Mags or Dest. 60 North Michigan, Change 1 11

CPT Wee Shirt Couffi Free make \$60.00 meets of \$ average orders a day Formus a six Made To Measure dress and such shirts at \$2.00 m sec. "ast to a 1 men. No such se needed Put] or part time. We to Parent Shirt Co., Dept. 646, Terre No. to Indiana.

IP years interested in making money in as find are the ha dreds of except all up a torities in Buseren's Opports ity bingerie Send name for just a or about its free Tel, as what is to be high now hips tun to \$48 M Deartorn, Dept. 48 Chicago .0 Industs

40 PB FIT On Competics—Famous nationally advertised Holl would Coah risks pay 80 1 Make \$25 day up. Hire of ers For free samples data it or to B1 die Corl. Grendate California. Dept. 1 856

First sur a prospect Request free sales & I showing the of belt horates. In did alred with curi mer a name and embrane area cap badges for truck of busins police fremen (horse Med embrene Host Fast Box 142576, Free Mence Rhade in a d

FREE Florida Vacation or Flumerite Earn Extra Major Fain Free Fig. Units I have been been by Units I have been by the court managine community representative but Florida Opportunity Journal, Dept. CR-67 Vero Beach, Fla.

SEEKING New Products? Oct my outfit 47 money-making specialities. Latest conreplences for home ray Send no more; Just your name Kristee \$1 Akron Ohio

BEAUTIPUL Posther Pictures Proc Delat a Semple 20c Stamps Apartade 1000 Maxico I D P BURINESS of your own. Earning pulsatial as high as \$46,000 an ion is lesued on \$12,500 times No inerthanding to buy Send for free explanatory lessuet Hazzell & Company Bux 4 DD. Lauurting Hi

51 des es à month for making dramatic 3-ne ons demonst atton of analise lightweight Printo Fire Estings after New cher al used by artures at Ta aut firm instant y Only 84 95 Terribe Cremnistons M. lessa want it Pres Kit Merida, 146 E 72rd Dept P-665 New York 18.

MEN women And to Set action a new more makers. Head for a hand-part ted of the more merits of the more merits. Since take orders outlet to commission has been presented and commission was do from and concert Sales outlet as Novelon, 3343 North Avenue, Chicago 47

12.00 TO \$4.00 Per Hour Information Free Children's Safety Swings, 1140 Lakeword Detr it 15 Mal dets

B O in his Stamp Social Socurity Pates E.c Protectors Sample—50c Catand Free Central Products, 148-PS State, A 340y 18, N. Y

22 00 Pres Dift Satts Highland N Y

SEE How To Make Extra Cash For Only 180 Get sample of smaring invention Fast-Way Autometic Door Closer for the for postage hard's librar at to Irenda, heighbors, storekeepers, etc. See how you can make two sales a minute casy, for his suffice profits Write V Cr. Dept. A sell. 5726 W. h. ondwa. Chicago 40 1:

EABY handwork makes fast-selling artiries. Sample free. Summade Company. Brackfou 66 Massach sects

EARM \$12.000 Tearly—only two sales daily World a Best Scher The Holy Bibes. (Hinstrated) Protestant or Catholic May-

SHOOTING Ply Swatter Box 67, Morris, Indiana Sample 50c, Postpaid

BUILD Profitable Renest Business Selling Retractable Ball Point Pena with imperiat. Blub quality Penal Penal Big Profit material total Carpental Penal Co. 277 Br. edwar New York T. N. Y.

50% COMMISSION Selling Bronze Social Becurity Cards Recal have Commer and a or or remails and Details Catalog Sales Rus 14 P Princeton Parties

PACITAIVE Line of Personal Initiated in a ra belts, cup hadges, 2000 emblems. Hout Past, Dept. PS. Rosnoks, Va.

Clerk ar mitable si be an symbol MexTen.

MARF Muchs selling his ers by mail at home, spare time from a sheer nylon atockings (not a id) sheet guaranteed a months. Receive do ar hos and heep them, we do ser and respect bosoned for an en supplied. Details free Deut 54. Receive des lands and Lawrence 64 Brookers lands.

\$1 00 PROPIT selling \$2 05 photo enargement of a Alien Studio. Respice Bidg. Little work Arkanasa

FMFE sample out to date emmera of the to deare and and age a rectal or Big or of the ad comment out of the Medical Ave.

44 HIGH GRADE HALLSMEN

FAST Moneymaker—New Development -- Uniforms advertise 34 hours a day Exclusive with Master Name emblem a own to dark Free matter Master, Dept. F 34. Walet Lancier Indiana

All Mat her Bellams or designs—18, 26 26 46, and 249 cht book matches. Burger spot cash comm with every business a sport to a series business to Bereata Start a bout to securious mes, a may to best to be a series were to be to b

MAKE Extra Money Cash commissions
for body burn cash to sell Advertising
bod Matrices to reach the life variety.
Commissions selling hit. Free. Steady repeatbusiness. No experience necessary Superior Match Company. Dept. P-558. 7838
B Green and (7 ago 1)

EDICATIONAL A

COMPLETE Your High School at home in source time with 6; year old achool. Tests furnis ed No lasses D slome information backlet free American School, De it 2048. Dressi at 16th, Chicago St. Limbia.

USED Correspondence Courses and Books soul and ceried Money back guara tee Cata of Free tC urses Bought I Lee Mou tax Progah A abams

STUDY For Decision a degree of Perchology Metaphysics and Lounder Currespender of the test at a Curage of Divine Metaphysics Dept F S 2811 Burth Liknots, Indianapolis 6, Ind.

BE a Real State Braker Blady of Bume Write for F to bush today Of ap-prived Weaver Schuo, of Real Estate Scient Oracid Kanasa City Mo Bume 1

EARN While You Learn Auto and Diesel Merhan & Master that too pa is tiede Mail) study and searn \$100 a week and up Approved for Rosean veterate For free information write Dept. No. 201 Mannylle Auto-Diesel College, Masterne J. Tean

HIGH School dipions at home Licensed States Academy, Box 8344-PA Station E. Atlanta, Georgia

WANT a Diesel Job? New Opportuni-ties to increase income. Higher Pay More Money We can help you Qualify Tools Shop method bome training. Write to-day! Dieset, Tractor, Heavy Equipment Division. Interstate Training Service. Deut B ? Portland 12. Oregon

ENGLINERICING Degrees earned through Home St do Star Do I ter at star I ver exty conserating as a Coloque of Engineer lag on at present 57 h A Ha to Manica Boulevard H system 10 Cast film

BOOKETEPERS Increase your carn-ings spring our out some med Da lar A Weeg Buckering a 6 Tax Hers you Fu, or spare time Dets a Free No obligation. Ellis, Bun 203 Cedar Grove Morth Carolina.

WEIDENS eath big money Easy to bear A c top Automate Welding New equipment on righting Here Housel Hubert Welding Achies. How P \$8, 1344 OF to

LEARN Miners, q and Lapidary Art at hone D a Cu se Ea 3 Ng Pr nto Making Cat me Jews to Free Cathing a Mineral Size of Institute Dock 3, 140 East Otelario Ci - san ca

PIAMO Tur ne pate. By money in apare time trace a histeria 30 de a 76 to ana knowledge necessa a P omigraphi ter it its toute at d traits, one for aired Person at traitment sets and after Feet at a g. Can Stall Form of School 3100 E.W. (Sth. Court. Fort Landerdaie Phiesda

MANTER Watermaking at home Free samps inster the age debug. 2328 WE Manager Ch. age 5

\$150 WERKLY earned by Advertising Cupywriters Post on pential Home Study Course guaranteed Weekly payments. Ad-Writers Guild. Chester Springs.

LEARN Another language at home, essily, quickly, naturally with Languaghone
The world's standard ontwerfall—at methed. You seem to epend From hoper of
the major is afrages a made on life ste
conversations, in ordinal a a like 1 nd
in another curles Compute language
course analoge on free trial hope
free book and details of free trial hope
is attention, Linguaghone Institute, The soe
lightion, Linguaghone Institute, The soe
lightion, Linguaghone Institute, The soe

MATHEMATICAL Casculations med easy with Abacus, \$3.00 Postpa d with I struction Book Abacus Company Be 2007, Torrance, California

#1.000 MONTHLY possible in collection seemed business. Write Cole Associates

I KARN By Rar' with Dorminhone While and acceptant the area of temperature are Dorm June to a gift to a short to be short to b tion. habit training dayed or time of fart so sim to to use thick on worth Used by ed atom to the the write today for fast or on Free Black No. to Miderturpt one. Inc. 12,-606 Radio ON THE City New York 30

MTN wanted age 10 to 45 to train as Draftamen Lesigners at home in source time Big pas question thes Write lie Free brochure American Technical Society 650 E 58th Bt Deut. 26 545 Chi cago If Lainote

MANY Rarm \$.100.00 per month operating rollect, in agreey Franklin Credit Ronnous Victors

LEARN Rest Estate Study at home Send for free catalogue. M dweet School of Real Estate, 66 North Chicago Street. Juiet Taponta

A Dynamic Singing and Speaking Voice can be yours! Self-Training records Thrilling driams Canbeld 20'8 C Figh Avenue Bouth, Minneapoils 4, Minneapta

LEARN Plane Tuning Easily At Home Our Graduates lend field Our coth year Pres Booklet. Hiles Bryunt School, Dept 3711 Stockton Blvd., Sacramente 30. California,

DANCE Complete Instruction Book Maked in plain trapping Calco, Box 257-hts. P. Misrauker 9, Wisconsin—82 96

EARS Degree Pres butletin Homenludven'r Midwestern Bible School, 1868 Broadripple Indianapona.

LEARN While You Sleep! Develop abili-ties un imited Courtel habits weight etc Pres deta in Write ABR Prundation Rox 616-PS. Kendall Sta., Miami 56, Pierida.

BOW to Write short stories, mysteries, articles Learn at home for career or as rapari time throme. Earn while learning William C. High Jr. sold Drat story for Lea Professional articles show you how would today for free less in and book. Farrer 1 at tate of Authorst n. 1888 U. M. Sycamore, Hollywood 28. CARIL

DEGREES, Diplomas, Certificates through extension on any subject. Personal consultation and specific interest \$1.00. Box 296, Jacksonville, Thinois.

WE Pay \$3.50 lb. dried. Orow Mush-rooms. Cellar, shed and outdoors. Spare rantomers Free Book Washington M the room Ind. Dept. 100, 2954 Admiral Way Seattle, Wash

ATLANTEAH science, remearnation metaphysics taught, Pres details, World University, Box 66, Huntington Park

KARN College Degreet, Correspondence Metropolitan University, Box 14, Claudaia. CALL LA

FRAR Review Self-Im, rovement, Edu-cational Books, Rainone Publishers Mid-die Village 70. New York

MAINFMATICA sceling Wird Power If weak is any of these site subjects we have what is needed to help you Write Home which Edu attorial Series, 224; Perry Sizest Davemport School

PHYSICAL Thermay and Massage Home Tru tig Pract e rivater of men units dont es and I muntain Pres Catalique Hatter al I avrilu e Box 6, 138 B Outage Ct cago, Limets.

LEARN - Teach Physica, Tracing Physical Therapy-Massage-Body Build-ing Literature Standard Publications St Charles 5, Illipois

ATR Cit differ lig. Healthy No contract. \$10 per lesson \$5 registration fee E-m-

HANDWRITING Analysis now accepted in college, business, industry Our men women who use graphs analysis spats, full time earling more money getting procat along field for a te agent men women at about to get about the need to re-mem bers Investigate this great of field at ere you give a real service to your fellow man Opportunities unlimited. Free sample lesson and information to all over 22 Write today! ICIAS, 2307 Mational Station Limit 1912. Springfield Misson, Cl.

UNET Correspondence Courses Educa-tion a Books Marc book O s acted Cat-a of Or C urses Baught t W and Baylon 78 Courtright W has Barre Pa

175FD Correspondence Courses Edo a tion at Books Bught Read Cutalog Pres-

INEXPENSIVE Correspondence Courses Re en e Trigineert g Iral is ten Abr ad Der ee testa Auroob Contral Saaley New

WAXF up your mind he what we de sire it ferrer to Life hanging facts free Wite he a 1976 F. Lee and e 1. Kening he

CONTRACTS

WIN contest money. Ownerst Contest Bulletin gives hundreds of tips. Lists cur-rent contests, rules. Sample magazine lis-Owners. C. steets. 1988 A East 5th Duhalf hillermoute.

PRIZE Contests Publiced Rome In reme the posterior in How and When to Win Your Scare Latest Contest Books Send Samp National Contest Books Send Samp PS March 16 Plends

DETECTIVES.

LFARN Civil and criminal investigation at hime Ears stendy good pay Emittate App red & once 1830 Sunhistor Dept 213 C? Nago 40 []

DETECTIVES Work home Travel perfence universance Detective Parti-u in a free We to Wamener P-125 Wes 86th, New York 24

DETECTIVE Training Philips Serret Service System, 1817-C North Esparth Chicago 30, Ill.

BE A Detective. Write for free details State Age Mational Detertive Ausdern's Deut A. P. O. Hest 1882, Scottsdale Arizona.

PROPESSIONAL Investigators Rome Study Badge, giptoma, future, Ben 41197 Los Angrica 41, California

LANGUAGE OUTFITS

SPFAK Spanish! Learn Conversation-Not is amment New Exciting Low Prived nature Spanish Pres Structure Manco Excit Routes Dept PSC 423 East 181st Street, Gardena, Cadlornia

BUSINESS BERVICE. PORMATION NAME LISTS INPORMATION ...

NEW name lists for mallorder businesses 1000 41 90 on gummed labels 66 90 Mel Bruner 5435 Puramen Ave. Ft. Worth. Texas.

1,000 — RAMES, Addresses, Gummed. Perforated Labels. \$5.00 Set. Dry Al's. 4821 Homerlee, East Chicago, Indiana.

EXPORTING Importing Billions Dollars

bought and sold in foreign trade, \$1 00 brings list 100 names interested in bus of and seiling to the Souncer 3335 Eings College, NY 87 MY

W 1MFN Mail Busers 1900 \$2.00 On gammed labels \$3.00. Northwest, Medina, Washington

MUPICIAL SERVICES

bAN Francisco Oak and Pematic 15c M: Is a so Also of de tal services 5 m al Merti es 2546 Bartiett. Oaksand

ARCHITECTURAL service at a low 30 Residential, commercial, industrial Fast e d personalized service. Write for par-ticulars. American Planning Service, 1232 South Sixth Street, Philadelphia 47 Pa

RESEARCH Information and pervices for everyone. Questions answered, or compiete theris, on your problem Any subject Reasonable fees. Prompt action. Write 1-14 Harold Dock, 1819 Poxworthy, San Jose 24. Calif.

EXPLORE and improve your thinking ability by amazing novel never-published scientific puzzles. Ask for three samples free! Prizes, rewards? Brain-Gym-Servfree! Prizes, rewards? Brain tou, Box 222, Barberton, Ohio

AUTHORS SERVICE

WANT Your Block Published? Learn how We not ish adve the promote distribute 120 West 31, New York

WRITERS Book Manuscripts invited for publication on our cooperative plan.

Ofer a, f hash Publishers, Atten Mr.

Ibsen), 400 Fifth Avenue New York IT. Hen York

WR'TERS Become published authors Pres a strated by chure reveals secrets of subsidy publishing publicity sales, for fiction non-fiction authors. Address Paul Sect Process Press 366 Fourth Avet av New York 16 M Y

ADVERTISING, AGENCIES, ETC., FOR ADVERTISERS

PROE capett assistance for ma hirder d se mar ents perform doughtlast even tentha Chicago Advertising DAGE 100 4 Ot Age (* frage 4

ADVERTING M words 100 Canadian Newspapers, 85 to Lists Free. Advertising Sureau, [0511-P Springsleid, Chicago 42

PARTOUNING, MEN

HOW To Make Money With Simple Cartante - A book everyone who likes to d. av should have. It is free, no obligation. Simply address Cartoonists fachange. Dept. 195. Pleasant Hill, Oble

CALTION Your tray to success International known detuctor its e h in a dipension is ten in a dipension of the control of the control of the control of the Buttle School, has 1981-6 Circulated 16. Ohlo.

CARTOONISTS' Magazine Leasens Markets Free Sample Carton vts 2716 to or do Court Le coin il Nobeacha

Tor' can Entertain with Chalk Talks Calalog 10c Cartoonist Baids. Canadah.

PAINT Signe-Master die cut, outline letter patterns Complete assertment. 175° to 12° high prepaid \$2.00. Eyerly, P-561, Newton, lowa.

TYPEWRITERS & OFFICE MACHINES

TEPEWRITER Adding Marhine Bar-gains! Proc List, Woods Typewriters, Bodford Per as santa.

RUBBER STAMPS & OFFICE SUPPLIES

THREE Line Metal or Plastic Purket Case. S. Of. Hard Stamps To F a 2" Mated Masters, P.O. Box 464 2. Buttale 5.

GOOD impressions pay 2 have Boardman P Haughton. New York 2 Diver \$1.00

THREE Lines \$1 00 Rubber Stamp Service 100 North Myatt Street, Tipp City.

GUARANTEED Railroad conductors ticket punch—thousand designs 25.95. Two personalized initials \$15.00 Postpaid. Bushy, 64 Eastern Avenue, Malden, Mass.

INDEXCED Cushioned 2 Lines 21 56 4 Or 3 Lines 31 50 (Script, Print or Old in glish) Free Stock Stamp Circular 2 Day Service, Toungare Stamp Shap. Princeton.

THREE Line Office Type of Pocket Stamp \$1 00 W 5 Atherion, Box 61, Randolph, Massachusette

ENGRAVED plaques for all occasions Send for our tree illustrated brownure duret Engraving. P.O. Box 1436 G.P.O. L.

OFFSET Bookset Printing & M. 8 page bkit, 5 yal's bound \$7,00 6 M 8 page hat 6';all bound 6 20 00 6 M 13 page bkit 7 yal's bound \$ 15 00 Copen Press, 105 Court St. Brooksen, New York

1 000 Bt SINESS Cards Raised Letters 12 50 Samples Ploness Inches Pack 12 PS New York

MIMEGICRAPHING Prints & Que to Work Resourch Prices Fra, most For-mer's Currier New Lebenon Certief N Y

OFFERT Printing 34 hour service \$6.15 ,000 \$ _a.t Nationa, Letters, 251 West 43 81 New York 36, New York.

QUALITY Business Frinting, Business Cards, Samples, Prices, Lombard, 296 West 5th, South Boston 27 Mass.

FINEST printing somet prices Bat rain catalog Decco. Box 3315 8 5t Louis

AMERICA'S abest quality printing unbestable prices, Catalog free, Steinbergen, 17 5 September NYC 20

SMART efficient printing, Moderately pri ed Free te sture it mes. 15 Boxdo: No Qur ; 7. Mass

f fic t 2 ARM 1000 Fed 87 25 000 8x8 86 00. Price List. Valatits, 1705 South 2nd. Price, 10, Pa.

500 7.12 POUR line gummed off-kers 501 Red Burder \$1.00 Murita Printer bugitum Marrigan

YO R Name Address Or 900 Labels Box 85c Posset Rubber Stamp 85c 99 Post Cards A 50 Parce Labels 85c H dreth Industries, 1947 Inner, Schenectady J. New York.

B NINTES Personal Printing Labels Rubber Stamps, Accessories, Hustrated Catalog, Free! Brose, 196-B. Clerk, Jersey City 5, N. J.

OFFICE forms. Illustrated satesletters, of a ers prepared offsetted Resourchie Windwide Las A am on 2 Ca f

| 000-8 | 11 84 5 | 11 17 - 8 1 66 818 - 84 56 | 1N7 18 MATION by return mail Plants Press P.O. Bux 2454 Artesia Canif

COMPLETE business printing Resson.

obse Free entirentes Mandeintam, 1:30

Hode Pa. & Chicago 13

PREE Cuta of Post and Printing D M.

se PRINTING OUTPUTS, SUPPLIES

DO your own printing. Bave morey but he rules we some ever thing for a for eters good printing the engray is too lieve home at at there is free Keiser Presses V & Menden Connacting Paper whose age prices and prices are prices and prices are prices. Brookman Paper City 3.5 Westelmater Ave. M. T. M. M. 2 & 0.56

MAKE Your Own self moiding rubber stan is and pr fing cuts Finalrubber Are le 2 Wisconsin

RI RHER Stan u traking presses ht drause operated electron heated Sizes had be 2 10 to 5 sta to g or his A a ride aupplies Custom Manufacturing, 167 N Jefferson, Springfield 2, Missouri.

PICINTING Presses T to Same see Lists le Turn bough Service Merchan aburg Pa

TYPE ares rabilets from man facturer Free catalog King McKey Company, 23175 Telegraph Road, Detroit 41, Michi-

READY Made Advertis by Ideas for all bust esses Impri. I di est maners and goodwal items for yourself or others Good, steady profit. Samples and prices from Oreas Adverts g here a "40 To ngs Avenus North Box wood, Can I take

A PATENT ATTORNEYS

C. A. Snow & Co.-5-427, Snow Building Wash gloo , D (Registered Paterl Astronal Write for information

INTENTORS Without objection write for no mate n sa, a street to extensive steps of should take to be use a Palest John Sta Smot Registered Patent At orney 207 histor B dill Wastington a D C

INVENTION Record form free and "Patent Information Every Inventor Should Have." Carl Milier Registered Patent Attorney, Woolworth Building, New York

INVENTORS—If you be sere that you have an west on you should had out how to at the first of MrM grow Berman & Day door in our head to take the secentariate of the Send for conform No object is McMorrow, Berman & Davidson, Registered Patent Attorneys, 143-O Victor Building, Washington I, D.C.

INVENTORS Lagra how you can protect your invention. A specially propared houselet. Pale I Guide for the Inventor containing detailed information concerning palent protection and procedure together at the Record of Inventor form will be propally forwarded to you apport requesting of the brings we are registered to the facts better the United States Patent Office and are prepared to serve you in the hand of a your patent matters. Carence A O Brief & Harvey Jacobson Registered Palett Atsorneys. \$22.0 District Mational Body Washington D C.

INVENTURES On de and Record of live tout free on request Prazik B Ledernance (34 Prazik B est New York C to

FOR INVENTORS

INVENTORS Send for free Palent In formatus South and Investors Rec rd Reg at ed Palent Atm es Associate Eve er Palent Office 8,2,829 Pale t A re & Adviser Navy Crepatinent IPIC 1947 Crut are Miller MPSI Warner R d g Was argion 6 D C

INVENTYMES If you have an invention for sale pate ted or o nateried a selfsit le of A or an 1 of the Deut 30A 632 FSt NW Washington 6 D C

INVENTION Record form free and Putent Into ma in Every II versor Should have and M or Registered Patest Attorney Will with Building New York

INVENTORIA William to be against write for formation on a none the steps of a second the steps of a second to the steps of the second of the s

INVENTORS from their sear invertion Patented of Unpaterted unt on territ out effer, write Coughli, Box 206. Marion. Other

INVENTIONS If you consider tout intertup to be something of imports a
take steam to pe test it with a Li ed
a stea Patent with a given you the right
to exclude others from hink g name and
se a six is a tirclas a med Patent
Proctam for I sent so in from stand
prompt of the Louisian of Patent
I obting an Victor J
I a s a Co Merin M I a a Registered
Patent Attorney 662 6 Merin Building
War ngton 6 D C

INSTRICTION Learn how you can protect your invention. A does a 'press of back of Pater! I doe for the inventor" containing data of informat in concerning paint price tion and procedure together with Res 6 of invention" form will be primptly? Founded to you upon request to the first of the are registered to pro-tice be are the titled States Patent Office and are presented to write you in the hand a of your painted to write you in the hand a of your painted to write you in the hand a of your painted to write you in the hand a of your painted to write you in the hand a of your painted to write you in the hand a of your painted to write you in the hand a of your painted to bush Regulared Paint Ar writers \$2A District Sacional But doing Washington D C

INVENTIONS warted now by my Manufacturer. Co. to. Paterted. Underted. W. te. bert Stame Patent British & B. W. Street. Pinazzial District. New York.

there are there there is no be ever that you have an invertion and should find out him to protect to The firm if M M error Berman & Davidson is our field to take it a necessar stack for our field for cons of our Pare to Bank et. Him to Project Your five in a self-insect ton Record form Number of the Mark of the Record & Davidson Head a seed Paters Attorned 141 P has for Building Washington 1 D C.

IDEAS Become Cash Send tour Idea and 2 00 for analyzing etc Reg State 2028 M eth Beachwood Ave Houseaud 28 Cast

INVENTORS' Have you good natentable ideas? W to Mr Metaler 11 West 42.44 New York

INVENTION M dels by t Precision not from P est Mase als No dir cast Write for Pr es (Tord C Hab. Box det Labers Kathas

INSTRUCT R & Ou de and Hererd of Investor Fee on Request Fin k B Ledermann. 154 Hasson Street New York

INVENTIONS protected without Patents.
Telestrice 262 Woodcolf Station, North |
Bergen, H J

FATENT Bearthes including suples of nearest patents. \$6.50. Reports airmsited within 45 hours. More than 105 registered patent attorners use my service, For Free insention protection forms write Muss And Hastings, F.O. Box 176, Washington 4 D.C.

PATENT Beatches \$6.00 68 hour alreman or vice Invention Protection forms free Write Pate . Engineer of Service, let 14th Street NW, Washington S, DC

PATENT Searches \$5.00. 48-hour service. Pres Insension Protection forms. Write Ra mond L Sm th, Patent Searcher 620 Sheraum Bunding Washington 5, D C

PREE Protection Furthe Needed Inventions List Interiors bases Office, Box 49 J. Wattington & D.C.

II INVESTIONS WASTED

INVENTIONS under Patented unputented. Tremendous Manufacturers Rata Global Marketing Envice, 2436 77th, Oakus-d b t a .

Patented or a spater of until you receive our offer write Congue Box 296. Marion, Or to

INVENTORS Hund eds of manufacturers have requested our newstation) localting constitution news in during Complete i formation free material of American inventors, Dept. 30C, 635-F Street. N. W., Washington 4, D. C.

Na ENTI NA Wanted "Fatented"Patert Pending 27 years cape terring
Price Aug 1 vertices National Serving
Bureau 1123 Me asset 8 Living 18 Mo.

INVENTIONS wanted now by my Manufacturer-Clients. Falented to pater led. W to 1 bert Adams Pater t Broker 80 R Wall Street, Financial District, New York

INVENTIONS needed immediately for manufacturers. For additional information write, Kessler Corporation, 751W, Premont, Ohio.

INVENTIONS Wanted Patented Unpaterted A fores deared by our cloud. In-mediate ofern about he autom 1 liventure Ma heling nervice, P.O. Bux 17 Dept. M. Ootsaare Trans

CARM Basers for inventions Write Nation at Inventors Institute. But 7667, Greenant 28, Ohio.

S MANUFACTURING

AUTOMATIC Point Menufacturing equipment. Finest formulas and training from 6106 Central Avenue, Hot Springs. Ark.

MANT PACTURE From Plants: Products of the transcripts.
Toys-Expands in 80 Times from at Send 62 06 for his containing them also Head Mining Instructions Care Price Prices.
P. G. M. B. L. & Watter Helmit, Ca.

64 MODELS, MODEL SUPPLIES

SHIP and yacht model fittings, bluspr to Re-d J's for Louistrated catalog 229 listing hundreds of Hests. A. J. Faler 1003-3 Etowah Are., Royal Oak. Markagan

NR.P M dels Most complete line in New England Kits Offices practs books, tooks era new motors 1956 i ustrated on alog the James Bills and Co Inc. In. t PS 342 Atlantic Avenue. Buston 16, Massact usetta.

R CERTS Build Your Own Working Mide's I and 2 stage Fu. Dete a on Core oction Fue Launching Fast em. Rectr a. Firing System etc. 8, 00 Dept D. 1 Resewood Drive Coumbia S.C.

M-DFT railroads you can build Send \$1 for detailed plats with a railroads you can build. Model Railroader Magazing, Dept. 141PS. Milwaukee 3. Wascoute.

MUDEL State Kale Pitteres a d Plane Inc. dos (Litera Tiumer Pichermen Figures Pitateer etc Tumbral of 100 for his Cauge 83.20 New 1848 Cataug 25c Mode & phase Box 85 Sugota NJ

ST Steam Engine Castings, Pittings Catalog to State Musicia Ltd 186 Summer And ter Musi-

Milliant RE Frances Gaseine and Steam Build Them on Your 8 ar 2" Lathe I attraced Care of Lie of Casting B. - raise Pit age etc. On a Dec. Dec. Box 5M-PS, Park Ridge, 1 and 1

POWER Models, Unusual steam, gasoit e a d t a ' on eng es fit igs metals fi ser so der and dappares, Unmarte chairs Ca alog \$1 00. Charles Cole, Ventura, Calif

LIONEL Trains. Big Discounts. Bulletin Free. Catelog. 25c. Mack Brothers, 2041 Chicago Ave., Chicago 22

STEAM engines, botters, castings, Catalog 35c, Anton Bohaboy, 2297 Price, Rabway, H J JUMBO Medeleralt Catalogs Ajeptanes, boats, Cars—Jie Rattrond—35c 10 006 Jierna Bargains Last Prop. America s Hubby Center, 1865, West 23nd Street, New York 11, New York.

66 NOME CHAPTEMAN

WOODWORKING and Californiahing course for beginning and advanced home training program as able Write for free booklet Interstate Training Service, Dept. O 2 Portland 13 Oragon.

PRIE Do it Yourself" Leatherstaft Calaing Tandy Leather Company. See 19. E25 Purt Worth Texas.

LEARN Art Metauraft and levelry making Complete his proposal home training busine now are labor historial tools and materials furnished. Write for free hooklet. Interstate Training Service, Dept. L-2, Portland 12 Oregon.

PRES Catalog 3150 Artist drawn Patterns, Designs, Craftplans, 1372-S Websch, Chicago 5.

MCSAICS Quatrated catalog and instructions 250 (refunded first order) Mossic-Arte Co., 7197-PS, Fittsburgh 13, Penna

SCOTCHLITE letters—mailten humper, signs kample list Sportly insissa. Miteficte No. on, N. Y.

Manorry toucers it each I for each brick Quart by Discounts Sig) Mfg Co. 430 Decause Ave Buffalo I New York.

great (CD:Wit redst thest and lumber, free price list Hedford Lamber Company, the by stile Tennesses

100 JicidaW Patterns plus alphabate 50c Bareto. O Fe on SPS. Missouri

BOUANERNOTTENS Make belts, handbaza our side dug trashes etc Bre-fal offer' Beginner's book catalog and quality oued san , ex 25c P. C. Herwig Cn. Dept. Il Pl. 30 Henry St. Brooklyn I. Hew York

FREE Information: Now to make your paint brack Belf-Cleaning prevent bristle curling last Three Times as Long Write Austin Machine Co. 2446 Main. Hartford 5, Comp.

STYLECRAFT Protesced leather Sta-Handback, No Solds Pi area Seria Patferns on leather Just carve assemble and lace Precarred the amount able ford the for ratable free folder Netunded Statorder Ausche Leather Company 2006 E. Washington St. Phoenia, Artsons.

LEATHERCHAFT Leather Cyaft Supoften Dies Embusaing Plates Copper and Aluminum Tauling Seriand 35c Leats Jours-304 Main, Fork Worth, Texas.

NEW! Hardwood Dies simplify beather tooling! 12 Dies \$3.25 Catalog 10v Pvt is Dies, \$95; Chairum, Detroit if Michigan.

DO IT YOURSELF

NOW Available! Nationally known power lawn-edger, bedge-trimmer in kit form Build your own with our parts, plans save up to 78% of retail value. For details, write Power-Trim, Box 8436, Part Worth, Ten

CLOCK Enthusiasts: Simplified Plan and Instructions to Build Authentic Grandmother Court 54 Inches Tall, \$1.50. A. J. Smelana, 942 H E 173 St., North Mami Beach Plotida

AIR Conditioners, Home, Automobile.

PACIFIC S ver Cloth En Converts Any Drawer to Pitted Unit. Keep Silver Bright \$5 95 Cabut Hendric \$6 P Contra) \$4. Wellenley, Mass

NUILD Novel Eyelevel Astarium From Oranpa's Picture Plans \$1.00 Dunning. 500 Post. San Prencisco, California

CYPREAS Knees seasoned polished, for lamps of names a ta Six assorted—46 75 231 00 down, Postsaid Guaranteed, Dipole's Deliver Sortings Fla

MOWER Kits. Complete, Easy to Assemble Write for Free Literature. Triangle 4P8 185. Port Scott Karsana

PAMILY Post Handbook ' 16 amail boot plans by any low rest renetraction photos, matractions In reductory offer \$1.00 WI are Wirts Professional Engineer Box 63 Paramus, N.J.

FAR Kit—Ideal for window at attic exAntiating unit in home or business. Beltdriven. All necessary parts for some Three
east motor and lumber for frame Three
stem averable 20° \$12.80 26 \$14.90
10° \$17.80 Direct Cash Orders th poed
proposed to deposit on COD orders
Offer good in US only 1, RP motor for
any size \$1.70 Send for free rate of
Kunnersburg Fam Shop. 212 Marquette
Devemport long

JALOUSIES have 56% Details Installation Photographs, Prest Alumalife Industries Rammonton, N.J. PRODUCATE roof steps has of shingles, the bake with amening self locking do its yourself Shingle Clips Dood by U.S. Ouversment. 16 plus pushed \$1.00 pamphles. Rescore Box 402. Livingston, N. J.

POPULAR Indoor Louver Shutters Inmail them yourself Denies Industries. Box 2076, Meridian, Miss

BOTHERED with hip porket, pant leg fumbling? Make handy houter type ham mer holder Hammer always quickly from any replaced. Valuable time saver Material with Instructions \$1.00 Proclams 5, 123 Crumabal, Amberst, Obio.

POT Water Aplenty \$1.00 from your present hot water heater net no feer of scalding Simple Instructions \$1.00 Res Water, Box 15236, Los Augries Caul

WATCHES, ETC

UNED and new watches \$3 up. Prec List Southern Watches, 5-PS So. Watches, Chicago 3.

COSTUME Jewelry Supplies. Settings, Phinestone etc 86 page illustrated ca a keg 25. Milady, Box 1226 G.P.O., New York City (1)

MICHEST Cash For Old Gold. Broken, Jews by Gold Teeth Was hee Diamonds 2 verbare 5, orto to Pieticum Mer ury Free information Ross Hebsers. Esyworth Side Cricago 2

BIGHERT Cash Paid for old floid Jew plry Watches Dismonds filter Cond Terth 100 , Pull Value Paid Immediately Sai sfactant foursetted Mail Arthurs T day Informat wifer Relationed 100 Chicago Gold Smrting Co. 6 E. Monroe St. Dept 427 Chicago 3 III

SHELLCRAPT Custume Jewe'ry Supplies Seashe's Our Stab year I setrated wholesair ratains 25c refunded first or der Forida A spile Mouse. But StTL. Bradenton Fiorida

PRICE limitrated Catalog Costume Jone rv Parts Repulled Pulsant & Box 52. Medford 55. Massachusetts

PREE Watch Care Pay Nothing Write Watch Outsets - Buteta Club. 500-Ad Pitth Avenue Nee York City M

16 SWISS Watches \$18 00 Catalog 25c Berkewitz | 150 Castlebly New York 62

CLETYPHADE only tigerous rings Request free drawings Lapidez, \$14 Porest. Custoset le sociole

DIAMONDS Flawless, Pull Cut, Registered, Mounted, Discounted, Write House of Marshall, Lyons 23, New York

CIOLD Silver, platfours, distribute wanted Cash immediates; highest pri ex appraisable made. Write 4 s. 1847 Bridge, Grand Rapids 4, Michigan.

FOR THE NOME

POAM rubber furniture cushione Parforr seconds to discussed Free rataing Ferma Piam, 200-A Mys Are Brvington New Jersey

CERNPOSES sentir tarks outdoor tollets received developmed without disping pullsping of Boxing Pres details Chemitus Cravpool Craming Company, Boxton 34 Massarhusetts

ALI MINI M Plumer Pole and Butes Distincticaly Different Many Color Combina tions and Suret Litera are Free Jell Watt is Mig Co. 115 Clinton St. Bullain, New York

LFARIBO Powers Tired of changing washers? Need grip of steel to turn of dap? Try "Amette" new type long life washer dissple to install sut of forest it. Best touch turns off Complete Household Kit plus Instructions \$1.00 (refundable) Aquette Products But 2'4 Rabyton, R Y

TO OF INTEREST TO WOMEN

MAKE 42s to 815 week's addressing envelopes that instructions terms for Olenway Fox 4548. Cirytonid 1 Ohio

DRESSER Sec. Show Mc Men's sufts 1 2545 2 54 64 trousers \$1.30 Better used cloth | Article at ing Proc Catalog Transworld, 164-T 78 Christopher Broodlyn 12, N Y

sationally advertised Huntwood Convertes pay 80 Make \$25 day up Hire others For free samples details write 8t dig Ottl. Clendale, California, Dept. 1185-G

MAKE Morey mailting Samples free PSM, 1907 SE 65th, Portland, Ore BEAUTIFUL Zari Embradered Santing

BEAUTIFUL Zari Embrudered Evering Bags from Ind a \$7.00 Robert Celaya. By wherein Texas

Wit Pay 23 50 To dried Grow Mushrooms Cyllar shed and outdoors. Boare for time, year round We have 25 000 customers Free Book Washington Mushroom ind Dept. 181 2006 Admiral Way. Seattle Wash. MCSFRY Truing Sewing! Details Proof Edwards, 2012-PG, 12th, Des Motoes 12, 5, was

200 to MONTHLY Puncible. Sewing Bat wear! No house sering Send stamped, addressed earthur. Cuties."
Warsaw 16, Indust.

81 600 00-45 sed so YEARLY Possible, Addressing Exercises, Postcarde, for Advertisers Further Information, Proc. Mar.a 427-C Woodcliff Lake M. J.

PASHIONABLE plantic rain hood, too protector, \$1 00 with case. Santgate, Box 341 P. Chicago 42

11 POR SALE MUCELLANGOUS

GERMAN Black Potent clocks, 41 45-51 90 Pres details, Metra. Box 18B. Old Mrsder New Jersey

HAWAIIAN Kona Coffee World's best Trial 2 ib \$2.00—10 is \$6.00 postpaid. Tropical Coffee, 307 Kilaues, Hile, Hawaii.

DRAFTSMEN Designers Students Make perspective drawings easily and quality with unique pinatic template Nothing like it on market. With instructions \$1.46 pentiate ft. M. Dennelly, 4111 Polt Ave., Hunston Texas

HAWAHAN Gifts-Fascinating list Prop. Hawatian Hut, 19631 Pairport, Detroit 5.

COMMERCIAL stainings sinks, tables, cabinels, etc Buchrock, 1645 Min, Bruckles 19

78 WANTED TO BLY

OCICESILVER plattnum silver gold. Ores aralyzed. Mercury Turninal. Horwand Massachusetts

TOP prices paid for old copies of Proteins Science—need only tables from period 1880 to 18.2 If books are complete even though condition is not perfect please write us and describe what you have the not send the Issue until you hear from as Write to Box 306. Tuckshop New York

CASH Querarieed by return mail for Olf Gold Bruken Jewelry Hings, Gold Treth, Fathrum etc Mail Articles Now Pres Information Rastern Refiners, 183 Plog Street, B. ustol, Conn.

18 TATTIBLENG BUPPLIES

LEARN or Stable, fascinating Tattoning Free il assisted information. Zeta, 528 B Leage, Runking, I I was

TREASURE FINDERS

MUST In Nidden Treasure Find is With a Geodest Treasure Pinder fleed Fine Pres Literature on Complete Less of Mineral & Metal Locators Underwater Detectors Fill Fried as Low as fee to In Comment on of La 25th Year colden Co. It trodues Mew Tyn apter instruments for meater Menaltivity Low Weight, Low Cost Planhight Batteries Write for information Today? Guidak Co. 1566 W. Clemons Blvd. Usendale Culif

COLD silver metal detectors Origor counters for arentant. Via tes Sensationals new face guaranteed modern Name Sper Information free Detection Corp. \$5.20 Varioused Ave. North Managuest, Ch. I.

TRANSINTOR Treasure Pinders, Geiger Counters, Latest Underwaler Defector Pres Catalon Sterra Scientific PH 21, 5413 York Lon Angeles 42, California

THEAST HE Coins, Builton Campon Rais cliverwary, M Scope Locators find them Newest Features, Terms, Calabon Pisher Research, Dept. C-2, Pain Alto, Ca. 2

PREE Literature—Lightweight, guaranteed Metal Detectors. Geiger Counters and Miners ights. E. to and Assembled Models Electronic Apply at the Dupt. S. Box S. Arlangton 10. Vary can

PIND lost or hidden treasures with new translator metal detector, underwater metal detector, underwater free desirance Cardiner Electronic Dept 1 1945 E Indian School Road, Phoenix, Article a

WATCH REPAIRING

WATCH and clock repairing books Pree catalog. North America: 2120 Bd. Milwauker. Chicago 47 Illinois

WATCHMAKERS - Jeweists Supplies. Instructions Calaing the Bergal Wholesalers Cu set City Cantorn a

WATCHMAKFHS Journa' for watch makers, beginners, hophetits, collectors Samule core like Dung Co., Box 218-2, Day Jose Beach Fin

MINCELLANDOUR

FREE Wholesale Catalogs' Sporting Equipment — Cameras — Homewares — Everything Reon-O-Mart, Whippany 6. New Jersey

WHOLEBALE Price List Proc! Save 50%! Appliances Cameras, Sporting Goods, Housewares, Hardware, Jewelry, Clothing. Gifts, etc. Buy Rits, Hawthurns 62, New Jerney

BUY Wholesales 25,000 Nationally Advertised Products. Get Amazing Dealer Catalogs. Complete Details Free American Wholeaniers, 1841 E Leves, Dalias 7 Texas.

RECEIVE Main magazine samples, offers, opporturities, get dated 25c Polaski, Box 272 Minmi 47 Piorida

WRITE For Free Catalog New Government Surplus-Cil Seif Instruction Books value over \$7 each Mathematics. History Foreign Languages Accounting Parming Automechanics. Establishing New Business, Etc. \$1.00 each postpaid. Choose from over 50 courses, Busines, Co., Dept. M. Elsinere Californ a

PEDALBOATS—FRINOUS kits, finished. Watercycles, Boca a) LIXII. Raton 278T. Fiorida.

FREE Literature - Make Big Money Raising Pishworms and Crickets. Carter Farm-12, Platter Ca

CUCKOO Clocks Save 50'r. Free List Virginia World Trade Co., Import Dept., Centreville, Virginia

WE Pay 63 to lb. dried. Grow Mushrooms. Cellar shed and outdoors. Spare full time, year round. We have 25 000 full time, year round. We have 25 000 customers, Fr se Book Washington Mush-room Ind., Dept. 187, 2854 Admiral Way. Scattle. Wash

RING-Valve Job while driving 16 00. Literature, Motaldy Grantham 37A, Pa SNOW Cone Machines Ast Prices And Special For Orocery Stores. Box

1803 Dalius Texas 10 ALL Different Mail Order Magazines plus out 4 page ist of unique imported faxt-suling items. All for 25c. Emerson Trading Company, Pompton Plains 4) Emerson

New Jersey RECEIVE—Magazine Samples, Malis, Catalogues, Offers From Everywhere, Oct Listed 25c, Rorick's, Cincinnati 26, Ohio.

CICIARETTES-Improved rober makes 20 for Dr. Pacts free, Moberly, Box 811 Owensboro, Kentucky

NEW! Zodine birthday charms. Free detalls. Eastgate, Box 882-P, Chicago 42

"SHOPPING in Britain" Catalog-yours ! for 15c Heritage Maning Service, 2291 Broadway New York 24, N Y

WAKE up your mind! Be what you desire! Simah worries fears, indectaions, inferiority Life-changing facts free Write Box 1924-P. Louisville L. Kentucky

19A WESTERN MERCHANDISE

PHES Catalog, Western West, Saddies, Boots, Leather Supplies, Silvar Spur, Box 1785-B28, Fort Worth, Texas.

PERSONAL

"HOW Can I Plad Out?" You Can! Information confidentially developed Any matter, person problem. World-wide Of-ficially licensed. Established 1922, William Herman, 15 Malden Lane, New York 38.

MEXICAN Legal Matters. A. Espejo, Box 214-PS, Hermosillo, Sonora, Mexico

PAY Your Bills Now, Borrow \$100 00 to 1600 00 Cash by mall Easy, quick, private Repay in small monthly lostellments over 20 months. Your payments may run % less than now, have money left over to spend Loan Order Black mailed Free in plain envelope Advise amount needed. State Pinaine Co., 321 Securities Bidg., Dept E-327. Oniaha 2. Nebr

BORROW Money By Mail. \$100-\$800. Anywhere Air Mail Bervice. Postal Pi-nance. 200 Keeling Building, Dept. 657H. Omelia Z. Neoraska

HOME Brewed Wines". Complete Book \$1 00. ABC Publications, Box \$49. Ban Prancisco I-WD, California.

LETTERS Remailed 25c. Monthly Rates. Reyl, 5209 Carter, Baltimore 14, Maryland.

PSORIASIS Sufferers! Discouraged? Write for Pree important information today! Pixacol Co., Box 3543-SP, Cleveland 18. Ob at

RUPTURED? Soft Rubber Pad, Com-fortable Straps, Top Quality, Guaranteed FR, Safety Truss Co., Box 2007, Torrance. CABL

RADIO caris von Announters needed Details 50c Radio, 3044 Greentree, San Jose 28, Celifornia

POUND The Lost Word of Power It's dinamite Use it' Details free Zahr P Vollmer, 58 Washington St., Denver L Cale.

FEAR Baldness? Losing your Hair?? Pind the way to a healthy scalp and beauliful hair through our method Save the hair you have Act now Send \$2.00 to Gerald Cardille Box 131-B, Hyde Park 16. MI HAS

LETTERS remailed 35c. Jerry 1419 E. Sird, Los Abgeles 1, Calif Love.

ENJOY Health Free Booklet Enclose loc handling Ruth's Nutrition, 152-PB Kearny, San Francisco S, Cauf

"COBRA. Self-defense street-fighting tricks." Designed to help peaceful adults \$2 Gaucho, \$46-S6 Sunnyside. Chicago 40.

LAS Vegas, Nevada, Conndential Re-mails 25c, \$3 00 Month, Classifieds \$1.00. Unique. Box 1176

MAIL Received-Forwarded 13 Month, Hedgreth. Box 430, Alliambra 24, Calif_

RULE Others with thoughts." Pull course—31. Adults. Controversial, satis-taction or retund. Clarion, 846-86 Sunnyalde, Chirago 40.

ADULTS .- Receive "Interesting Mails." Send 25c Bants (Desk-S, 76), Chatawa, Mississippi

REMAILS 25c anywhere buy area from San Jose to Sucramento. Classified \$1 00 son's. P O. Box # 1055, Antioch, Colifornia

MAOIC Sex Indicator reveals innermost secrets. Develop "Personal Power." Free details? Dimensional Enterprises, Sedona A. Artzona.

VITAMINS-Bave 48% Buy Direct. All Formulas Free Catalogue. Vitaspec, Box. 4435 Y Philade, phia 40 Pa.

MEXICAN Law, Attorney Cen Apto. 79. C. Junten, Chih., México. Ceniceros,

ATTRACT Peace of Mind. Happiness and abundance through new interpretation of the Bible. Solves all problems. Write for Free Polder. Ontology, Homewood 148.

BLACK Forest Clocks--\$3.86, Binoculate German Imports--\$4.99. Robinson Co. (Imports), Jos. us, Tree, California.

WAKE up your mind! Be what you de-sire! Smash worries, fears, indecisions, inferiority. Life-changing facts free. Write Box 1924-Q, Louisville 1, Kentucky



EXCLUSIVE! PRE-ASSEMBLED KITSI

CATALOG . . . SEND TODAY! New! Pre assembled this save up 🔣 😘 astembly time Band for Free Catalag Cruisers. Munabouts Now ' Mode's 12-18' Supermart velertion of Fiberglas & Accessories.

1415 W. 92nd St., Dept. A-5

Bleemington 20. Minn.



WORLD'S LOWEST PRICED

COUNTS UP TO 308,595.539 IDEAL FOR BUSINESS AND PERSON-AL USE—GUARANTEED ACCURATE Not a coy Operates with only a finger fick Adds. firk Adds. subtracts that plas, divides Counts up to one the pieces. The Personal Inc. of Business Income Tax and School to-o NONEY BACK GUARANTEE Send than and Address. Pay postman only \$2.95 plus

nowage Beaut ful rich looking Lastherette Case in need 22 Setuit hi not looking Later pett that in-cluded at no extra cost. Money back in 10 days if not delicated ACENTS WANTED. CALCULATOR MACHINE CO., (Mire.) Box 128 Dept. T-E2, Montington Valley, Pa.

PAIR MOST EVERYTHING MADE OF METAL Biscope Appropriate or an Auto parts the Welder

a and patrick out times! playground confirmed charte, talk on terminantal aron work mater, wagners out for the second transmit of the sec

wordy of carbon welding and braning rade Saider. But and complete with the last artifect on Book. Attractive-partiable-effected-durble-1 year seems of the partial carbon braning and complete with the last artifect on Book. Attractive-partiable-effected-durble-1 year seems of the partial carbon bad out bestern as

SEND ONLY \$3.00 could be then and pay positions \$6.00 plus COD post on principle of sould \$5.50 plus \$1.00 postage and we will send postpaid library and for mechanically introded home owners ref. affices friends butter new for early delivery. Avail side only from:

MIDWAY WELDER

Q

Dopt. DPS-8

Kearney, Nebraska

VEED	Annual Property of
YOUR. BENJA	THE REPORT OF THE PARTY OF THE
ヾ 🌬 HIGH HE運輸C CO	Account
AIR COMS & CO, GAS COMS—Top Gual	lity of LOWEST PRICES!

DENIAMON SUPER Single Shot City Carbine \$14. Bulaco (BB) Model with Custom Stack (Shown) \$17.85

8 All Models Benjamin CO3 Carbine Gas Rides and Benjamin CO3 Rocket Gas Possio Lise Standard Star COs (Soda) Cartridges (available everywhere). 2 Surge W LD Jet Power-High for Small Game-Low for Target. Up to 30 Shots from Each Cartridge 80 Pumping-Sale mice-the Task.—12 Models—BB or 177 or 22.

Response Air Rides and Benjamin Air Pistols are Recognited AD Over the World for Finest Workmanship and Highest Quarty at Larwest Pract. Admissable Power with Amusing Optimum Force. Fully Committed. Sale. Accurate. Economical. Easy to Use Anywhere... 12 Models for Target and Small Game 22 or 177 or BB from \$16.50.

Montele Sterie | Catalog

on, Acoussomes, etc.

Offer on Hasting & Federal Biller! City.

Catalog All Sand Sand RESUARISM AND ROLL CO. MAIL 100AC. RS2 MARRIER ST., ST LOUIS 4, MQ., U.S.A.

Nacion Address.

State.

HOW smooth sanding makes smooth sailing

Send for your Free copy of this new Behr-Manning guide on boat painting, varnishing, and finishing. The beauty and life of your boat depends upon



the proper protection.
For the best in Sandpaper, Sanding Discs,
Masking Tape, Norton
Sherpening Stones....

FREE!

BEHR-MANNING CO

7001, 0. 1.

A BIVISION OF HOSTON COMPANT



lept.					rey, N.		
lease	send	jere	your	Boat	Sanding	Bulde.	
leme.	_	_					
ddrei	-			_			
illy					7	State	

MAGNETS

AMAZING, PERMANENT, HON-SLICTRIC HIGHLY PRACTICAL. Conduct interesting experiments. Mandreds of uses Retrieve valuable steel from 18the a data of Lana tackle from freeb at ani water tools from 18the a data of Charanteeto Try any magnet one week Money back if you are not well-pleased.

No. 8-015 Wt. 70 on 1 list pull of 225 lbs on sleet block 110 00 No. 8-015 Wt. 70 on 1 list pull of 125 lbs on sleet block 110 00 No. 8-015 Wt. 18 os 1 last pull of 125 lbs on sleet block 110 00 No. 8-015 Wt. 18 os 1 last pull of 125 lbs on sleet block 110 00 No. 8-015 Wt. 13 m.) Has pull of 25 lbs on sleet block 110 00 No. 8-010 Wt. 13 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 13 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.) Has pull of 50 lbs on sleet block 10 00 No. 8-010 Wt. 15 m.)

MIAMI MAGNET COMPANY, 3240 N.W 27th Ave., Miomi 42, Flo.



SEAL JOINTS FOR GOOD

Easy to Spread, Rosely to Use, Good Coverage, And a Little Door o Lat.

Rogers Glue is always clear because it's chemically pure... always strong because it's made from the best materials... always uniform because it's laboratory-controlled.

Moisture resistant; won't get sticky and loose; does not streak or stain wood.

SPECIAL OFFER: Send just 20c for full-size jar of Rogers Glue. Receive FREE: Rogers Book of Woodworking Shop Notes, plus a set of up-to-date Project Plans. Write:



Actual Tensia Strength Over 3,885 Res. 980 29, Jack.



But a can of Regers Glos . . . at your local store.

68 POPULAR SCIENCE

HOW TO GET MORE FISH REVEALED IN GREAT \$1.00 BOOK!

"Worth its weight in gold!"—that's what you'll say about the OUTDOOR LIFE FISHING BOOK by P. A. Parsona. This fact-and-photo filled book tells how, where, and when to get more trout, bass, panfish, muskie, salmon, grayling, pike, pickerel, walleys, and every other fresh water sport fish in America! Over 100 pictures, 25 chapters jammed with practical showhow data on fly casting, bait casting, spinning, trolling, wet and dry fly know-how, bugs and poppers, natural baits, ice-fishing, knots, boats, and lots more. And the OUTDOOR LIFE FISHING BOOK is yours for JUST \$1.00 postpaid! Send name, address, \$1.00 to:

OUTDOOR LIFE

Dept. PF658

353 4th Avenue, New York 10, N. Y.

GET A GOLDMINE OF HUNTING AND SHOOTING KNOW-HOW IN GREAT \$1.00 BOOK

Jack O Connor, Shooting Editor of Outdoor Life Magasine, and America's top gun expert, hands you a miltion dollars worth of gun and shooting know-how in his OUTDOOR LIFE SHOOTING BOOK, It's packed with inside tips, expert advice on small-bore rifles, big game rifles, shotguns, handguns, ammunition, scopes, sighting, chokes and patterns, plenty more, Lavishly illustrated with 100 photos, diagrams, trajectory tables, ballistics charts, etc, Large format, fully indexed, handsomely printed—worth its weight in gold And the OUTDOOR LIFE SHOOTING BOOK is yours for JUST \$100 postpand! Act fast! Send name, address, \$100 to

OUTDOOR LIFE

Dept. PF658

353 4th Avenue, New York 10, N. Y.



American League Batting Champion

ED WILLIA

says "Crosman Pellguns hit where you aim!"

Ted Williams shoots a 1/2" target group with the new Crosman "400" Gas-Powered Repeater.

"When it comes to relaxing indoors or out, you can rely on Crosman Pellguns for year 'round shooting fun. It's a real gun... with a button rifled barrel that means hitting where you aim. It's not only inexpensive, but noiseless . . . no powder, smoke or recoil."

ed/Williams

WRITE for free new shooting book. Crosman Arms Co., Inc., Dept. PS-17. Fairport, New York.

Shooting is 3 Times MORE FUN with

In Canada: Cresman Arms (Canada) Ltd. In Maxico: Crosmon de Moxico, Moxico 4, D. F.

Without Powder *

World's largest producer of pellet rifles and pistols



SMALL BOAT EQUIPMENT CATALOG Chest, full of the Street Monager 76 Pages fell of Equipment for Small Books, Outboards, Ross

LAMP & HARDWARE CORP. 1944 PITE IS AVE. BELTIS IN Y

HULL AUTO COMP SILVER ANNIVERSARY MODEL Case in gleaming, shiny silver finish See it, along with regular 5-color selection, al your dualers. CONTRACT.



For 25 Years, America's Favorité Motoring and Boating Guides



\$5.50 to \$7.05

Write for Literature

ates 200 6 9, Warren, Delte

aluminum or fiber glass



Feather Craft, Inc. 449 Bishop Street, N.W.

Atlanta, Georgia

MAY 1958 69

Spring fever



HARLEY-DAVIDSON

SPORTSTER

The open road is a clear call to outdoor adventure. Your answer is the Harley-Davidson Sportster . . . with surging response to your lightest touch.

Cat-quick acceleration blends into a smooth, effortless pure — thanks to the big 55 cu. in. OHV engine. Here is pulsing power perfectly engineered to obey your every command. Hydraulic front fork and swinging-arm rear suspension combine to give cloud-cushioned comfort. Giant brakes stop you smoothly, safely.

Road-fashioned from front fork to flashing tailpipe, this gleaming streamliner is available in a wide range of harmonious two-tone color stylings.

Make a date with a Sportster

Stop at your Harley-Davidson dealer for a date to test ride the 1958 Sportster. Ask about his liberal trade-in deals and low monthly terms.

HARLEY-DAVIDSON MOTOR CO.

76 POPULAR SCIENCE



Wagemaker

Molded plywood inner hull (no dirt-catching ribs) plus lepstrake outer hull. (Patents Pending). Extra strong, extra stability. Black or white finish. 12 models from 14' to 19'. Also molded plywood and aluminum models, in a most extensive line

Free Literature

FRED ARBOGAST CO., MIC. 2525W Horth Street, Abrea 3, Ohio Dept. 24

WAGEMAKER COMPANY, GRAND RAPIDS, MICH.

ARBO-GASTER CATE DIG BASS WAY DOWN DELF



for BAIT CASTING

for SPIN-CASTING

Ameringly weedless, rolls over deep water snags. Perfect control, casting or trolling. Won't twist or lum over 3 SiZES 4/8 oz - U/4 oz - 5/8 oz - 5/8 oz - 5/8 oz - 6/4 oz - 5/8 oz - 5



ROCKET PLANS

Vap. two. Can Suite Your Own Soild Part Rocket! It a no secret! New easy to-ful an plans give you the complete details becomen to exercisely by lastick a high altitude rocket harapeas we to build me gree out technical harabedge required the sink 2 paper allog diagram for construct as the rocket the electrical 3 agreem issued by tack furt to one etc. Only \$2.00 page. Send cash obeck or M.O. Saltofaction guaranteed.

ROCKET, Bapt. PS-5, 5917 West Dird., Los Augains 43, Calif.





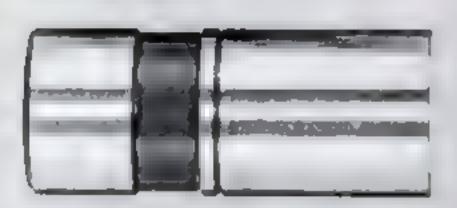
For smooth running, quick starting, better mileage . . . install a genuine MILES/MASTER. Prevents flooding. Only \$6.95

MILESMASTER, INC., Dept. J. Exeland, Wisconsin

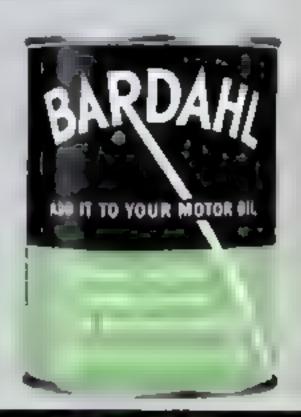
QUIET

VALVE LIFTERS work smoothly, quietly with Bardahl. Add one quart of Bardahl to regular oil. Prevent buildup of gums and varnishes,

free sticking lifters, end valve clatter.



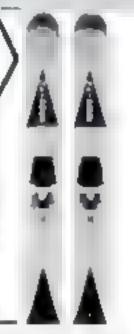
BARDAHL World's No. I Seller-Available everywhere



No.90 enty. 52300

An exceedingly fine set of skin, full size, light weight tough fast buoyant. Besonply moulded plywood with waterproof adbreiben aufustuble bindings to fit any fout. Each pair carefully malched and bajanced, complete patrolaction absolutely quaranteed. At your MICHIGAN WHEEL drafer or prefer direct - COO if you wish Send eard for FREE relation of boating accrenories, propellers for better skiling, top speed or fun

MICHIGAN WHEEL COMPANY DEPT, PS 5 - GRAND RAPIOS 3, MICH.







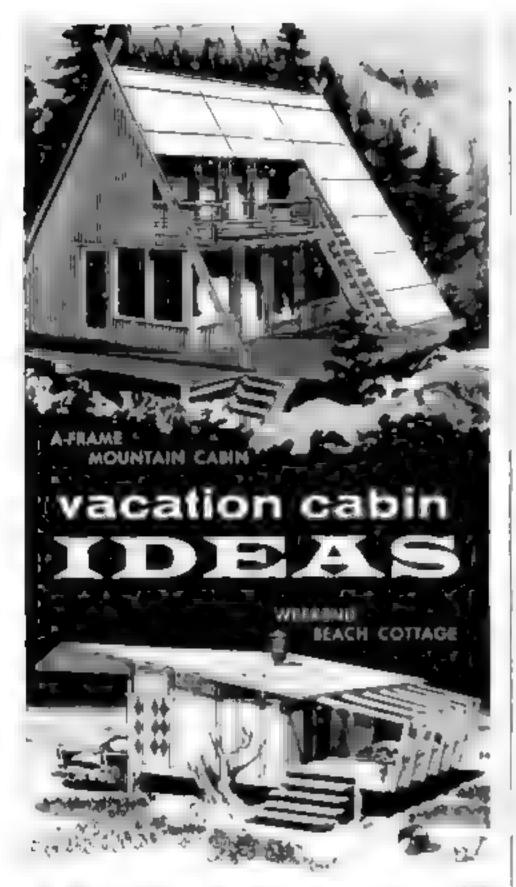
BIG DEMANDII

Sell all you produce to Department Stores Homeowhets Parkt, Nutseries and Pictor Groves Exceptaces sell on a ght. No experience necessary We supply full operating sostructions and contoment mus the know how that spells BIG PADFITS. This is an autstanding appointfully for men of basten and small capital to get into a bast fith our name town Mail coupon at once for full details so to now you can reserve your territory. Atolds sold only on exclusive franchise,

GENERAL ENGINES CO., Inc., Dept. SF-58 ROUTE 130, THOROFARE, NEW JERSEY

Mr. Tor of Philodelphia writes. Sold 250 in first 4 months. Selfing to Seora Roebuck, John Wanamaker and Gimbel Bros. la Philadelphia area.

Name	-	 M-44-1144	
Addres	E	 	
City	+++++	 Zone	18444
Stole .		 	



NEW full-color booklet shows 20 easy-to-build fir plywood cabins

HERE'S the perfect source of ideas for anyone planning to build a vacation cabin. Smart, modern designs by leading architects for cabins of every type and size, complete with pictures in natural settings, floor plans and building tips. Plans call for simple, straight-forward construction with light, strong fir plywood to save you time, money and trouble when you build.



The Dodge That Saved the Day...



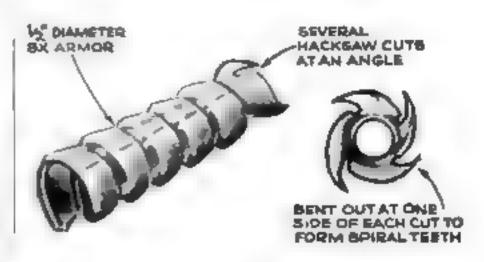
One fine Sunday morning the lavatory bowl in our bathroom refused to drain. We were due at a family wedding that afternoon, had a hundred miles to drive, and my wife and daughter frantically told me they just had to wash their hair.

Still unshaven myself, I cleared the basin drain plug, but water still stood in the bowl. Opening the gooseneck plug, I cleared out sludge there, triumphantly replaced it, and got set to whisk off my whiskers. But the water I ran in to wet my shaving brush didn't run off.

Again I opened the gooseneck plug, then pushed rods, screwdrivers and bent wires in at every angle. On the wasteside pipe of the gooseneck they were stopped by something that wouldn't move.

Getting a two-foot scrap of BX cable from the basement, I pulled the wire out of it and hacksawed a few shallow cuts at an angle in one end. Then I bent the armor outward on one side of each cut, forming spiral teeth.

Pushing this as far as it would go into the gooseneck (it followed the curve), I turned it against the tooth direction. The points caught, held, and I pulled out the clogging mass in one try. For our family, that dodge saved the wedding day.—O. J. Philberry, Cedar Rapids, Iowa.





Warning to wives of fishermen and would-be sailors:

THIS CAN HAPPEN TO YOU!

We warn you now—there's nothing quite so irresistible as your first ride with a '58 Evinrude! Nothing is so apt to completely shatter your complacent routine—to propel you into a new world of outdoor activity, family adventure, excitement, fun affoat!

We know, because it's happening to more families every day. It happens because outboard boating—with today's big, safe, comfortable boats—fulfills more dreams for budget-sized family fun than anything that's

happened in America in several decades!

It can happen to you—but that's for you to decide! All we ask is that you discover the pleasure of effortless Evinrude power in the dazzling new Lark or the magnificent V-4 50 hp Starflite. Frankly, you're in for a thrill when you try sound-sealed quiet... floating-power smoothness... and see the dramatic new jet-sweep styling! Make a date with your Evinrude dealer now for a ride that will be a revelation to you and your family!

isn't it time you tried it?

le's REVELATION RIDE time at Evintude dealers everywhere. Call your Evintude dealer now. Look for his name under "Outboard Motors" in your phone book. Catalog free—write Evintude Motors, 4268 N. 27th Street, Milwaukee 16. Wat.



quiet outboard motors

A District of Outleand Marine Corporation In Canada: Mid. by Eviarade Mante, Peterbarough





From the labs...

The Car That Drives Itself

The car in your future will be run by black boxes while you watch. Here's a peek at what's coming

By Martin Mann

DROVE a car no hands. It steered itself safely down the center of the lane, up the straightaway and around a hairpin, automatically following an electronic track.

Sure, the job I rode was experimental—strictly a breadboard rig cobbled into a green Chevy. It automates steering alone, and that only on a one-mile-long GM test road and a 300-foot stretch of Nebraska Highway 2, which are the two places in the world equipped with the

electronic guiding track that is needed.

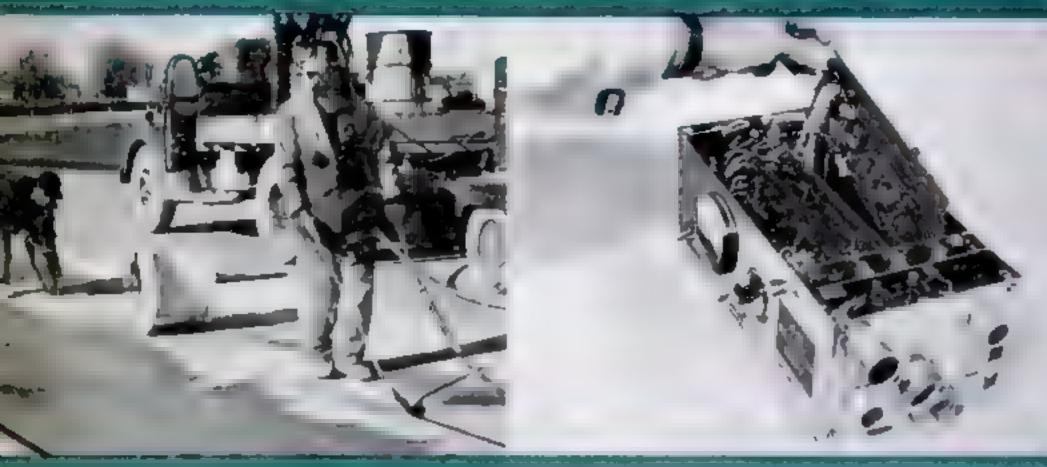
31 1 1 1 1 1 1

Yet it is aignificant because it is one of several steps leading straight to the car that drives itself. And that, a tour of Detroit research palaces convinced me, is definitely coming. Not this year, probably not next, but still soon.

Idea men at Ford, General Motors and Chrysler are noodling over a problem you know well: Broad expressways crisscross the country for high-speed, no-stop trips betweeen cities. Powerful, roomy cars make such travel convenient. But...

Beguiling roads and cars invite heavy

GM wants to control cars from units built into road



ELECTRONIC TRACK that automatically steers cars is simply cable, laid in Whish naw-cut in concrete and then covered with asphalt. It emits weak radio signals along its length.

GLOVE-BOX COMPUTER is of the analog type, employing voltages to represent car a location on road. Meter on front indicates location visually to permit use for semi-automatic steering

use. Drivers follow too closely, can too easily get into multi-car collisions. (One pile-up, on the fog-draped New Jersey Turnpike November 15, 1952, involved 16 cars, injured 24 people, killed two.)

Most auto-research engineers agree on the ultimate solution: "a loosely coupled train." Since automobiles have now assumed much of the railroads' intercity travel function, they will have to operate by railroad principles. This means at least semi-automatic control of path (tracks) and headway (a block system).

Technically, this can be done now. The engineering foundation, if not all the hardware, already exists.

Next question: *How* should it be done? Here, agreement stops.

General Motors has latched onto a scheme originated by Dr. Vladimir Zwory-kin (the TV-tube inventor) and his assistants at RCA. It uses radio signals from devices in or alongside the road to control the car. The car itself needs little beyond a radio receiver, a mouse-brained electronic computer, and some links to existing power-assist machinery.

Ford's research specialist Victor Raviolo snorts at the idea of putting the works in the road. "I won't live long enough to see the U.S. highway system rebuilt. Reality deals with something you can add piece by piece."

Chrysler, apparently uncommitted to either approach, takes a dim view of the safety value of any automatic control.

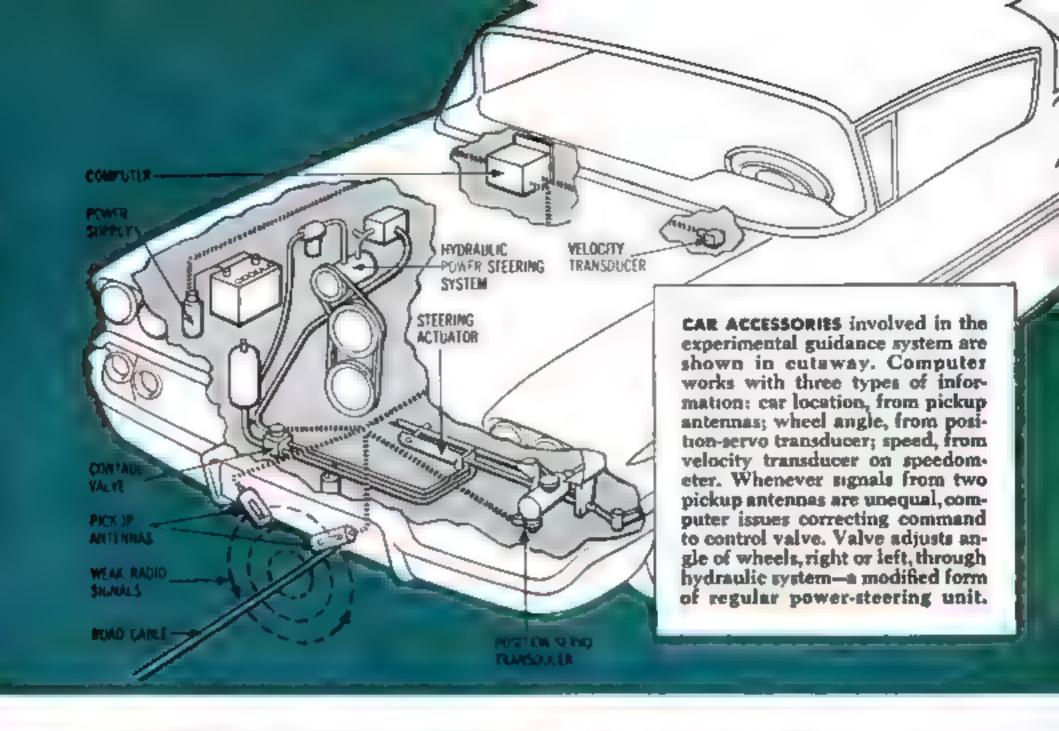
Electronic tracks. The GM-RCA system controls both path and headway through an almost literal electronic translation' of railroad practice. Instead of steel tracks there is a cable buried in the center of the highway lane. Instead of block signals, roadside radio transmitters govern accelerator and brakes.

Automatic steering is the simplest to work out. Here is how GM researcher Joseph Bidwell has done it:

The control cable is just a wire buried in the road. A slot for it is cut by running a diamond-wheel saw down the road.

The cable is fed alternating current at a low frequency (below broadcast-radio band) and low power (a couple of watts would take care of 100 miles or more of cable). So the cable is really a radio-transmitting antenna (its range is so short that it is not legally classed as a transmitting station). It generates an electronic track of weak radio waves straight down the middle of the lane.

The car has two receiving antennas: plastic tubes containing ferrite-core coils



and rectifiers. The radio signals picked up by the antennas are rectified to DC (to avoid trouble with capacitance of the wiring) and fed back to a small electronic computer in the glove compartment.

The computer—a couple of printed-circuit boards and 15 vacuum tubes—compares the voltages from the two antennas. If it gets higher voltage from the right-hand antenna, it knows that that antenna is closer to the cable than the left one and the car must be sidling to the left. So the computer signals an electro-hydraulic servomotor under the hood to make the power-steering mechanism turn the wheels to the right. When the computer gets equal voltages from both antennas, it knows the car is straddling the cable, and it holds the steering machinery steady.

The system works quite well. It's eerie. The car follows the road, the steering wheel turns, all without human interference. Still, there are bugs:

The control hunts, that is, overcorrects first one way then the other. This despite the fact that the computer calculates the rate of change of voltage from each antenna and bases its decisions on variations in rates rather than on variations in the voltages themselves. Some unexpected wiggles—particularly noticeable in the back seat—were caused by misalignment of the track. It was laid with the edge of the road as a guide, and that was apparently not true enough.

These faults are easy to fix. The real trouble is that automatic steering is not much good without automatic speed control. And that's tougher,

You need two types of control: 1) a maximum speed, adjustable for weather and curves, and 2) collision prevention.

Again, low-power radio signals would do it. For the first task, small transmitters placed along the road—where speed signs are now—would adjust the upper limit on an accessory like Chrysler's Auto-Pilot. Highway officials would set each transmitter to send out a speed signal safe for the stretch of road it covered—essentially what they do now with signs.

Collision prevention. Dr. Zworykin's idea, already tried in Nebraska, involves current-carrying loops of wire buried in the pavement. Passage of the steel in a car over the loop changes the electrical inductance of the loop, varying the current. Computers at the side of the road, detecting this current variation as the car passes over successive loops, flash warn-

Ford's plan to help the driver: accessories on the

ing signals along the road behind the car. The signals are transmitted by the same radio units that send speed maximums.

In effect, the car triggers block signals as it moves down the road. In the block immediately behind it is a powerful crash-stop command, in the next distant block a medium hit-the-brakes order, in the most distant block a weak ease-up warning

The receiver on a following car picks up the warning signal and feeds it to the car's computer. From the strength of the signal, the computer deduces what car speed should be to prevent collision. If actual car speed is higher, it does things with brakes and accelerator.

GM, hoping to eliminate the detector loops, is now soldering up a new, stillsecret system for collision prevention

As far as the car is concerned, these computers and radio receivers should add to its cost about as much as an automatic transmission. But the highway has to be studded with electronic gear. The expense, \$5,000 or \$10,000 per mile, is peanuts compared to the cost of the highway itself (upwards of \$1,000,000 a mile), though it does add up. The real problem is time: It takes quite a while to get all highway officials to agree on a new idea, far longer to get them to put it into countrywide use.

GM's Bidwell expects an elementary version of this system in a usable length of highway within a year or so. It would be added to gradually. On the opposite side of the fence, Ford's Raviolo thinks it would take a century to equip all U.S. highways. That's why he dismisses control from the road as impractical now (but agrees that some roadside elements)

will eventually be necessary).

Control from the car. Raviolo settles for limited objectives. He is not aiming yet to make a car that drives itself, but simply to provide the human driver with

more and better information.

Still, he is willing to try this the hard way—with equipment on the car, accessories that you buy. And he is tackling a difficult and pressing problem: collisions—more specifically, rear-end crashes.

Even here simple gimmicks can help a lot, Raviolo cites a few off the top of his

head:

Expert motorists drive by the guy

ahead. So stop signals readable at greater distances would be an easy and useful improvement. (The Christmas-tree-drape fins on recent models are one step.) But why not put tail lights on a mast atop the car? Then, in a line of cars you could spot a stop signal many cars ahead.

Yellow slow-down lights, to warn following drivers to think about getting ready to stop, might also be worth while. (A few years back a popular accessory was a miniature traffic signal hung in the rear window. It showed green, yellow or red, depending on whether the car was going steady, slowing or stopping. It was allegal in many states—the law frowns on green or yellow lights to the rear.)

Why radar doesn't work. Anything beyond simple light signals gets very tough indeed. A black box that automatically tells you when you are too close to another car—a proximity-warning device in engineering lingo—has to sense the presence of an obstacle, calculate the rate of closure with it, then light the danger sign when necessary. It must work day or night in any weather. And it must never make a mistake, neither missing real danger nor crying emergency when there is none.

There are five or six ways to make a prox warner. And there's something wrong

with every one:

Radar. Even assuming size and cost could be licked (a police speed-radar set comes to \$900), an insurmountable fault remains: discrimination. Radar "sees" any solid object. At a curve, it would mistake cars in opposing lanes, or an embankment or trees off the road, for collision-course obstacles.

Radio beacon. A small transmitter broadcasting a weak signal around the car, to be picked up by receivers in approaching cars (like IFF in military airplanes), would work. But only if every car, truck and bus on the road were equipped. This defect is fatal; it has helped stop another good auto idea: polarized headlights.

Infrared. Cars give off heat, all right. The difficulty here is in making detectors that are sensitive enough and able to

measure range.

Light beams. No good in bad weather. Sound. Air, unlike water, is such a

car. Coming first: an automatic collision warning



WILL IT LOOK LIKE THIS? "Proximity warning acreen" (oval between two glass balls) is on dash of the current Ford dream car, La Galaxie. It's just a styling mock-up, without works.

MAST FOR TAIL LIGHTS is simple device that Ford suggests to reduce rear-end smashes—drivers could watch stop lights many cars ahead. Yellow "slow-down light" could also help here.

poor conductor of sound that a sonarlike ranging system seems out. The sound beams wouldn't probe far enough away from the car.

Despite this bleak outlook, Ford is playing around with prox warners. I saw one, an operating model built to show off at a board of directors' meeting.

It was a laboratory-bench stretch of model railroad, with two locomotives representing cars. Engine No. 1 carried a pair of headlights, Engine No. 2 had a photoelectric cell pointing at Engine No. 1. The photocell was connected to a simple computer able to figure the rate of increase of light intensity.

As Engine No. 1 overtook No. 2, the computer kept tab on their separation through the light change, finally blinked a warning lamp.

This scheme is not much good (it won't work in daylight or fog) and Ford has abandoned it. Another type of prox warner is in the mill. What kind, Ford won't say. It could involve radio induction (the RCA-GM concept moved off the road into the car) or infrared (great strides in military equipment are just now being declassified).

But this much is certain: It will be small, entirely car-borne and no more expensive than a radio. Don't forget the old radio. One piece of "safety equipment" already installed in nine out of 10 U.S. autos is the radio. Today it is as much an aid to driving as a source of entertainment

The commuter who navigates by radio is a commonplace. Before he backs out of the garage, the loudspeaker is feeding him admonitions, advice and police flashes: "Take it easy, fog on the parkway," "Jackknifed truck has tied up route such-and-such," "Bridge traffic heavy but moving," and so on and on day and night.

Highway people have encouraged this idea, but the big push came from the radio broadcasters themselves. Having lost their big home audience to TV, they found they could make money by providing a public service to the TV-less motorists. Now the auto experts are hot to expand and improve radio-driving. Some attempts have been made. For instance:

 New York City's Lincoln Tunnel for several years broadcast bulletins over its own private radio station, audible only within the tunnel.

The New Jersey Turnpike considered building a transmitter of its own so that it could talk to motorists, but has shelved the idea. (Reason: cost.)

Los Angeles radio (and TV) stations

[Lontinued on page 326].

Preview of Polaris:

Quick-Trigger Missile to Rise from

By Wesley S. Griswold

NE long-range U. S. ballistic missile in the works already seems too good to be true, though it is still some months away from test-firing. That's the Navy's onrushing Polaris, named for the North Star, which can be launched from a submerged submarine to hit a target 1,500 miles away.

Polaris, two years ahead of schedule now and "closing fast," as the admirals say, is due to be flight-tested this fall and operational by 1960. It gives promise of making its big brothers—Atlas, Titan, Jupiter and Thor—seem clumsy, overcomplicated and too conspicuous.

Those other long-range missiles have to be fired from large, fixed bases—immovable targets for enemy counterweapons. The missiles themselves are huge, vulnerable to saboteurs, immensely complex (Atlas is said to have 300,000 parts) and exasperatingly slow to prepare for firing. Their fuel is highly inflammable and the liquid oxygen they use as an oxidizer has a temperature of minus 276 degrees F., so that it boils away constantly and threatens to freeze missile parts.

Polaris, on the other hand, given a fleet of nuclear-powered submarines to

carry it through the seas of the world and lie in hiding with it off foreign coasts, for months if necessary, will have two decisive advantages: secrecy and mobility. It will be much smaller and simpler than the land-based ballistic mussiles now being tested. And, unlike them, it will be as ready to fire as a rifle cartridge, for Polaris uses solid fuel, which can be stored safely and indefinitely.

Since there is hardly any place on earth that is more than 1,500 miles from ocean waters, the world's military targets will all lie within reach of Polaris. It shapes up as the most arresting deterrent weapon so far, for it will threaten a potential attacker with retaliation within minutes, from unknown directions and hidden locations.

"The enemy would be in the position of a man trying to find a black cat on a vast and empty plain on a moonless and starless night," said Rear Adm. H. G. Rickover. Long-range missiles hurled upon an aggressor from an "underwater satellite" such as this "would draw the enemy's missiles and bombs away from our cities and factories and farms and toward the uninhabited seas," the admiral predicted.

Even one submarine carrying a capacity load of 16 Polaris missiles will pose

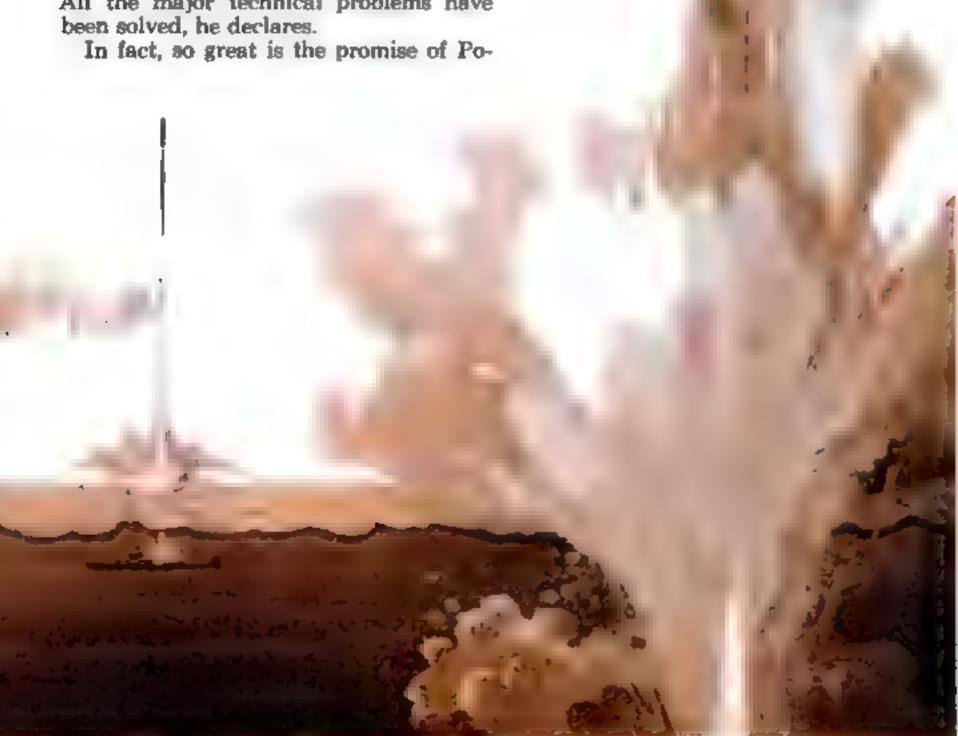


Launched from ocean depths by wide-ranging nuclear subs, Polaris will threaten the enemy with instant retaliation



a threat of incredible magnitude to a hostile nation. Multi-megaton warheads have been packaged in smaller and smaller containers as thermonuclear know-how has expanded. Despite its relatively small size, each Polaris warhead will burst with an explosive force of more than six megatons, the Pentagon has revealed. This single sub's cargo can be as destructive as 100 million tons of dynamite.

Polaris, which grew out of early Army-Navy teamwork on the liquid-fueled Jupiter, has generated such enthusiasm among the men who are in the process of creating it that Rear Adm. William F. Raborn Jr., director of the project, says the biggest problem they face is overoptimism. All the major technical problems have



"Scientists' eyes light up when they see Polaris the way sailors' eyes do when they look at Marilyn Monroe"

laris that the Defense Dept. recently announced that it will be fired from land bases as well as from beneath the sea.

"This is a more sophisticated missile than Jupiter," Adm. Raborn says. "It's a sexy little devil. Scientists' eyes light up when they see Polaris the way sailors' eyes do when they look at Marilyn Monroe."

In modern military lingo, the word "sophisticated" implies improved accuracy and efficiency. And Polaris, one-third as big as Jupiter and Thor, is "little" only as IRBMs go. It is to be about 30 feet long, five feet in diameter and will weigh around 30,000 pounds, says Rear Adm. John E. Clark, chief of the Navy's Guided Missile Division.

How can 16 missiles of this size be packed away in one submarine? The nuclear-powered subs that will carry and launch Polaris will be the biggest in the Navy and, so far as we know, in the world. They will be 380 feet long and 33 feet wide. Each will have a displacement of 5,600 tons. The first three of these giant submersibles, which will be whale-shaped like our experimental submarine Albacore, the Navy's fastest, have already been ordered. They will be ready by the time the missile is, Adm. Raborn predicts.

Polaris will be launched from the ocean depths much as a torpedo is fired. It will be shot to the surface by compressed air, and its rocket motors will ignite as the missile breaks clear of the sea. The firing crew will know exactly how many seconds it will take the missile to reach the surface and will set a "programer" inside the weapon to touch off its motors when it leaps out of the water.

Each of the great subs being built for Polaris will carry 16 vertical tubes. The missiles will be fired straight up instead of from bow and stern tubes like torpedoes. This will make it easier for each missile's flight controls to steady it, first in the rolling sea and then in the air, as it roars upward on a trajectory that will rise 350 to 400 miles above the earth and span 1,500 miles.

Polaris is often called a "second-generation" missile, because it benefits from the trials and errors of the much cruder missiles that grew up before it. For example, Polaris' inertial-guidance system is "the finest and smallest missile-guidance system yet developed," says Adm. Raborn. A "bundle of tiny gyros and integration accelerometers," it cannot be jammed by enemy radio or radar.

The Navy IRBM could carry either batteries or a midget generator to spark its mighty motors and supply current for its guidance system. The final choice may well be a gas-powered generator, about the size of a can of soup, that GE has already built. This marvelous mite converts liquid hydrogen peroxide into a high-pressure stream of gas that can drive a turbine.

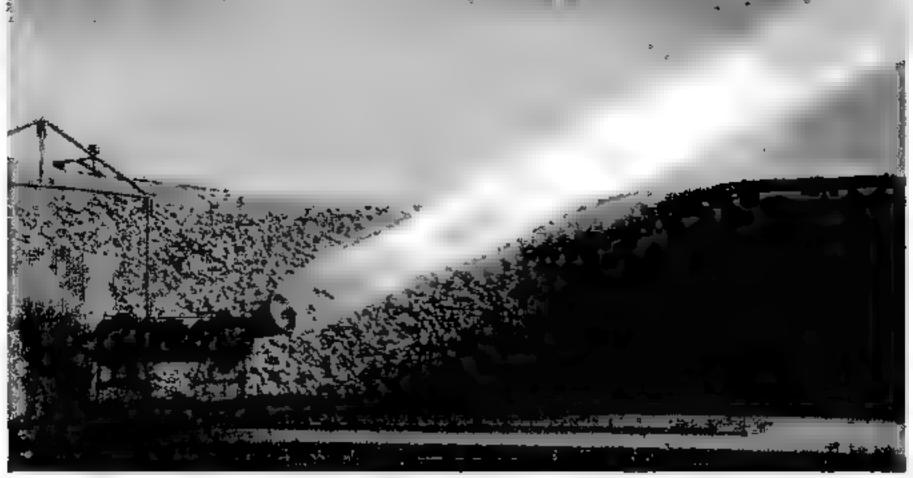
The most important event in Polaris' young life, however, was a recent break-through in solid-fuel technology, achieved by Aerojet-General Corp.

In firing a long-range ballistic missile, it is essential to cut off its motive power at that precise point where speed, altitude and heading are just right to let it fall from there to its target. If this cut-off point is either premature or delayed, the missile will miss its mark. For years it has been thought that such precision could be achieved only by liquid-fuel motors, in which valves can instantly be closed. There seemed to be no feasible way to shut off a solid-fuel motor so abruptly.

Furthermore, liquid fuels had a decided edge on solid fuels in specific impulse—the amount of thrust derived from a given weight of fuel per second of burning. Liquid fuels, as one missile engineer put it, just had "more poop per pound."

Then, within the past year, Aerojet crashed through with ways to overcome both these handicaps to the use of solid-fuel motors in Polaris. (It was known from the start that it would be unthinkable to try to launch a liquid-fuel missile from a submerged submarine.)

Details of Aerojet's achievements are largely secret, but Navy brass have declared that Polaris can be smaller, simpler and more reliable because of them. Outsiders have guessed that cut-off may be achieved by some thrust-reversal mechanism, or simply by the timed destruc-



POWERFUL SOLID-FUEL ROCKET MOTOR, the type used in Polaris, is tested at Aerojet's plant near

Sacramento, Cal. Unlike hard-to-handle liquidfuel rocket, this one is always ready.

Not only can the solid fuel's burning time now be exactly limited, but its specific impulse has been given a sharp boost. It is a high-energy propellant, according to Adm. Raborn, who describes it as a "light-to-dark-gray odorless powder, safe to handle." Since Aerojet has been doing research with boron compounds since the early 1940s and recently formed a partnership with Stauffer Chemical to develop and produce them, it may have been boron that put new fire in Polaris' fuel.

Fuel improvements made it possible for Aerojet to produce a much lighter, more streamlined power plant for Polaria than had been anticipated, but it is still the largest ever made for a specific missile using solid fuel. It has been estimated that Polaris' motors will deliver around 130,000 pounds of thrust for somewhat longer than half a minute.

Polaris' skin will be stainless steel or aluminum alloy, Adm. Clark has said. Its snub nose, so shaped to deflect most of the intense heat generated when it plunges back into the earth's atmosphere at 9,000 m.p.h., will be covered by protective layers of plastic, copper, or possibly beryllium.

Before Polaris is ever fired from the ocean depths, it will be trial-launched from surface vessels at sea. But before that, it will be given an intensive workout on as strange a test apparatus as has ever

been built. It is a huge device, created by Loewy-Hydropress, that exactly simulates the pitch, roll and heave of a ship at sea. Magnetic-tape recordings already made of the motions of a vessel on the ocean will be fed into this monster machine, set in a hole 75 feet deep at Cape Canaveral, Fla., and the machine, with gimbals and enormous hydraulic pistons, will reproduce every motion exactly. The apparatus will be able to test-launch Polaris, too.

But this amazing missile would be useless if there had not been a development in navigation to match those in missile technology. By conventional methods, no point in the ocean beyond sight of land could be located precisely enough to serve as a launching spot for an IRBM. The missile's guidance system must know exactly where it is before launching in order to measure the distance accurately to where it is supposed to go.

That problem has been solved by security-cloaked SINS (Ship's Inertial Navigational System), devised by Dr. Charles S. Draper of M.I.T. and built by Sperry Gyroscope. This inertial-guidance system will keep Polaris-carrying subscontinually informed of their position, the location of true north and the craft's speed. SINS, which has been tested in a year of voyages by a special vessel called the Compass Island, can give the geographical coordinates of a spot beneath the waves as precisely as if it were a street corner in your home town.

NEXT MONTH: The first nation to control the weather will wield a power greater than the H-bomb, Read "Weather as a Weapon"—in PS for June

SPUTNIK I'S CARRIER ROCKET (arrow) is tracked by radar with movable 250-feet-wide howl of huge English radio telescope (opposite page). Rocket's turnbling motion gave intermittently bright streak in these-second-exposure photo made for Air Force by Arthur D. Little, Inc.

What We're
Learning from
the Satellites

U. S. and Russian "moons" bare secrets of space to cameras, radio, amateurs' telescopes

By Alden P. Armagnac

HE satellites are paying off. From a region of mystery beginning 100 miles above the earth, the Space Age's new frontier and the gateway to the moon and planets and stars, U. S. and Russian artificial moons have been wresting the secrets we must know before man himself braves its perils. And the information being gleaned from our first Explorer and Vanguard satellites and from Russia's Sputniks is proving packed with surprises, riddles and invaluable hard facts about space.

Twenty-five miles of magnetic tape, 11 inches wide, arrived one day last Feb-

ruary at Caltech's Jet Propulsion Laboratory in Pasadena. By oxcart and by plane, it had come from faraway Nigeria, Singapore, and other spots as remote. That was a typical day's news from bullet-shaped, 80-inch-long Explorer I as it wheeled around the earth on the initial rounds of its majestic 115-minute elliptical orbit, dipping to 219-mile altitude and zooming to nearly 1,600 miles.

Within its instrument-containing nose—a dark steel shell striped with white bands, to control solar heating—two radio transmitters prattled away as incessantly as a news commentator. In a code made public so all the world could listen and understand—musical tones forming dissonant chords until later unscrambled—the rapid fire signals told of temperatures, cosmic rays, and meteors in space.

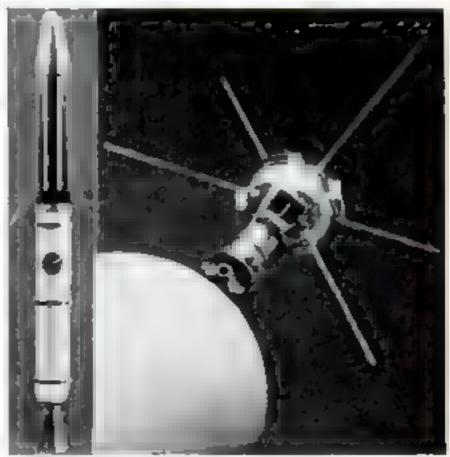
Some messages went unheard and were lost. But for periods of about five minutes



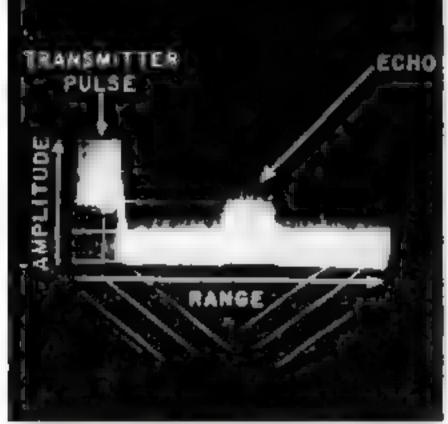
apiece—whenever Explorer I awooped within range of "Minitrack" and "Microlock" receiving stations all over the world—the precious messages were caught and preserved on tape. Thence they went to JPL; there duplicate tapes were made and forwarded to the State University of Iowa and to the Air Force Cambridge Research Center, the others participating in the experiments.

Hazards awaiting the first space traveler, it now appears, will be less formidable than many have supposed. That's the gist of a sampling of Explorer I's early messages

Temperatures: 32 to 149 degrees F....
That's Explorer's outer skin temperature, reported by beadlike thermistors and resistance thermometers; it's ranging much less widely than expected, as the satellite whirls from shadow to sunlight... 40 to 104 degrees F.... Inside Explorer's in-



FIRST U. S. MOONS are 80-inch Explorer, left; and 6.4-inch Vanguard sphere—forerunner of fully instrumented Vanguard 20-inchers—shown on nose of rocket that becomes a satellite, too.

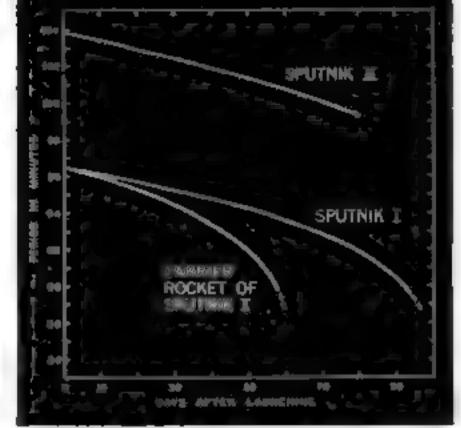


RADAR ECHO from Sputnik I rocket was obtained by powerful M.I.T. transmitter at Westmore, Mass. Echo's position, along line marked "Range," shows rocket nearly 600 miles away.

sulated shell, everything is cozy for batteries and transistors. (And not too far from livable temperatures for humans, when they get to riding in space cabins; probably that upper figure can be lowered a bit.)

Cosmic-ray count: 29 . . . 31 . . . 41 . . . That's from a Geiger counter aboard Explorer, as heard in Nigeria, southern California, Florida. High, but not dangerous, as it was feared the penetrating rays might be, up above the earth's protective atmosphere.

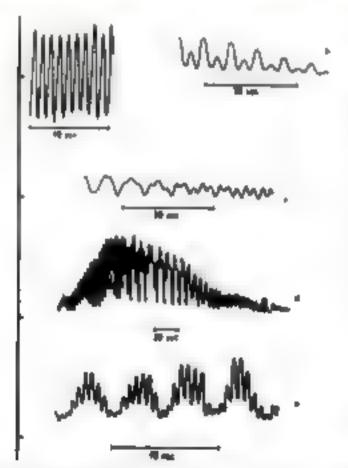
Meteors: .01 particle per square meter per second, 10 microns or larger . . . In scientific language, that's the story of an



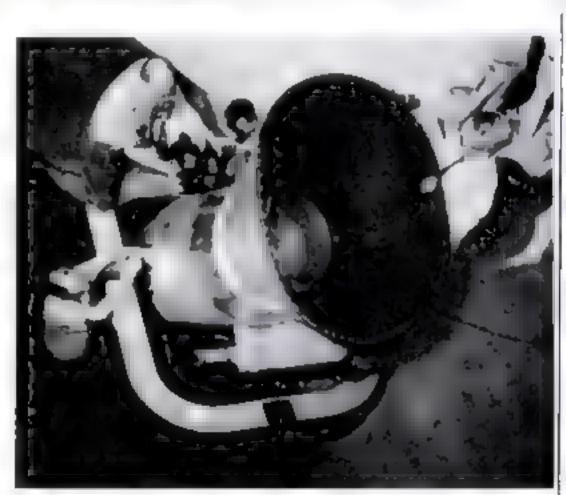
PERIOD (time to circle earth) drops with altitude. At 87½ minutes, end is near; 84-minute orbit would graze earth, but moon burns up first. (Chart from Sky and Telescope.)

"erosion gauge," with one of its 12 fine wires severed by a meteoric particle within the first nine days—and of an "impact microphone," recording the ping of other particles that hit the satellite shell. In layman's language it means that bombardment by meteors, of dust size and up, shouldn't be so much of a hazard as to prevent space travel.

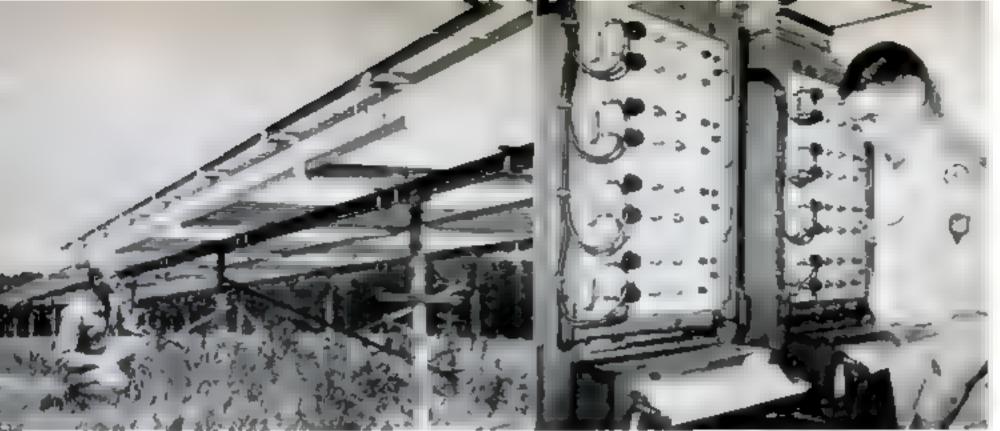
Later U. S. moons introduce refinements. The second Explorer put into orbit had a tape recorder, designed by State University of Iowa scientists to register all cosmic-ray readings—so that none would be lost—and read them out on radio command from a ground sta-



SQUIGGLES show many varieties of fading of radio signals from Sputnik I. They'll aid studies of ionosphere. (Charts from Nature.)



GIANT CAMERA photographs satellite against background of stars, for highest-precision tracking. Here is the first picture it caught of Sput-



MINITRACK STATION at Blossom Point, Md., uses great horizontal antennas like one above to pick up radio signals from U.S. satellite wheeling overhead. Receivers automatically

yield direction-finding data, on charts unrealing from bottom of panels in view at right. Other equipment makes tape recording of instrument readings transmitted by satellite.

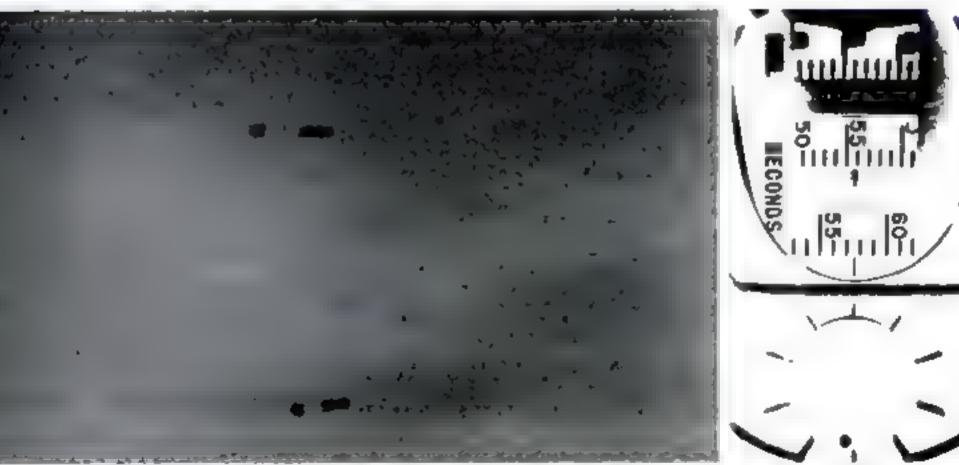
tion, Tiny Vanguard I's principal contribution has been successful trial of a radio transmitter powered by solar cells, capable of transmitting data for years—instead of the few weeks at most that chemical batteries last. While Vanguard I reports only temperature data, its 20inch successors have been designed to carry much more elaborate scientific instrumentation.

Biggest upset in space lore comes from Sputnik I—and credit for it goes to the amateurs of Project Moonwatch, who tracked the 25-inch sphere of polished aluminum with little low-power telescopes. "With very few exceptions," says

the Smithsonian Astrophysical Observatory, "the only scientifically valuable visual observations of the satellite proper were obtained by Moonwatch teams." From the observed orbit, the Observatory's scientists have announced a startling finding:

At satellite levels the atmosphere appears to be nearly nine times as dense as expected. While it's so thin that it still amounts to a near-vacuum—only about 1/3,000,000,000 as dense at 140 miles as at sea level, by the tentative new estimate—the difference from predictions strikes space planners like a bombshell.

[Continued on page 228]



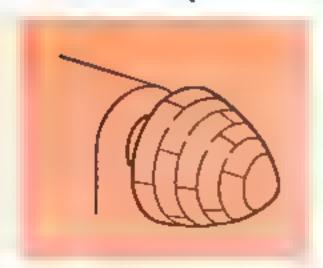
nik I rocket. Motions of camera "stop" and "smear" the satellite (lower black marks), and star (upper black marks) from which its posi-

tion will be measured. The film simultaneously registers time, from crystal clock, to accuracy within 1/1,000 of a second.

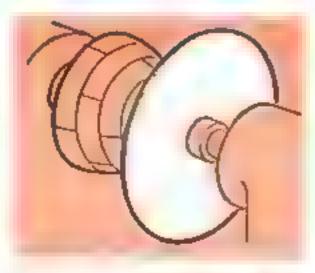


Cone rolled of sheet metal is spun over a form at Phoenix Products Company, Milwaukee,

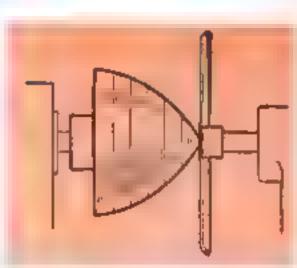
Motion and pressure stretch metal by cold flow · · · · ·



FIRST STEP: Form of desired metal shape is turned of wood.



METAL HANK, a flat disk, is held against the form so that it is forced to rotate with it.



SET IN MOTION, the disk is hibricated and its edge bent up to keep it from buckling.



to streamlined shape needed in missiles.

Spinning Strange Shapes for the Space Age

Giant lathes, molding metal as a potter's wheel does clay, make things to go out of this world

NE of the oldest of metalworking arts now helps build for the age of space. Spinning is a technique by which three-dimensional shapes are made from sheet metal. Many such spun parts are used in modern missiles, high-altitude balloon gondolas, and atomic power plants.

Metal spinning consists of rotating a flat disk, a cone or a cylinder together with a form of the desired shape, and gradually working the metal against the form by the pressure of blunt tools.

Even when this operation is done cold, the metal flows and stretches under the tool. Recalcitrant metals and complex

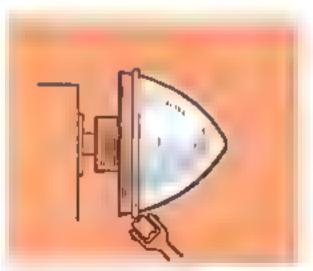
PHOTOS BY W W 40RMS



SMOOTH-NOSED TOOL is now pressed against the spinning disk, starting at the center.



to keep metal thickness uniform as the spinner forces it farther and farther over the form.



REMAINING EDGE may be rolled over into a bead to add strength, or may simply be trimmed off.



arain casing for a missile is spun with aid of flame. The work-hardening 5 32-inch-thick aluminum allow used must be continuously an-

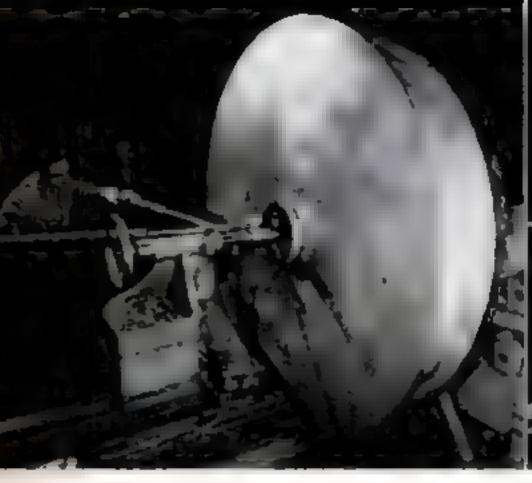
nealed during spinning. Form is of steel to withstand annealing heat. The work is done in three stages, and photos above show the final one

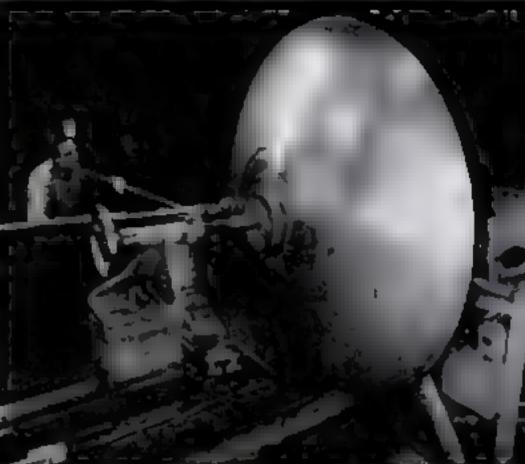
Tool marks found on Egyptian artifacts suggest that the ancients were familiar with this technique. Thanks to hydraulic-powered lathes pioneered by Spincraft, Inc., it has kept pace with modern metal-

lurgy and our need for huge, difficult-tomake shapes in the missile age

Because hydraulic power multiplies the tool pressure while affording precision control, aluminum allovs, titanium, inconel, stainless and chrome-molybdenum

BULKHEAD FOR JUPITER: Dwarfed by the eightfoot blank in his huge lathe, the spinner below is making a fuel-tank bulkhead for the Army's big missile. The long-handled tool and its fulcrum pin are both worked by manual effort alone. Below at left, the blank is in place. At right is the finished bulkhead spun over its wooden form and ready for removal.







The tool end has a roller on it, and is controlled by the spinner. His helper (at upper left, above) controls long-handled fulcrum pin

on which tool lever pivots. Tolerance is .010 inch on diameter and edge thickness. Photos were taken at Spincraft, Inc., Milwaukee.

steel, all vital in missile work, are now spun with the aid of automation to tolerances and in gauges formerly impractical.

Yet so versatile is the process that the same plant may turn out stainless-steel dog dishes and missile bulkheads, TV- tube shells and rocket-fuel tank heads.

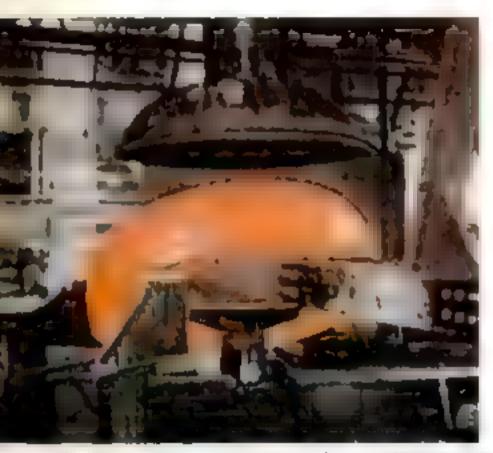
The accompanying photos show some missile parts in production. Pictures on the following page show heavy steel heads being spun at red heat for more down-to-earth applications.

MEAD FOR A TANK that will feed liquid oxygen to missiles is spun from 10-gauge stainless steel. The form is concave. The spinner rides a power-driven tool carriage. Ball-ended tool is worked

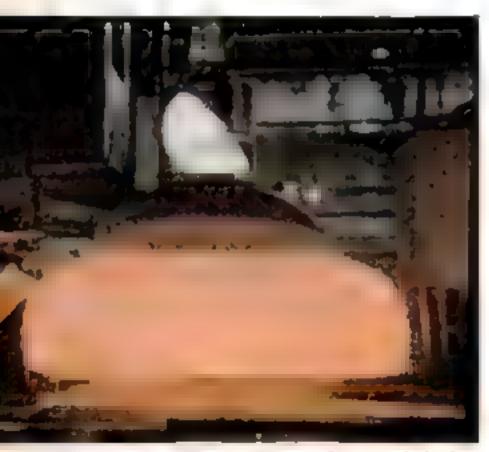
from center to edge and back again for six passes, spinning the metal inward against the form. Like bulkhead at left, this is a job at Spineraft's Milwaukee plant.



THE FORKLIKE PEEL deftly enters blazing furnace to lift out a red hot steel blank



nunged onto the form, the workpiece is centered by guides as the peel withdraws.



SPINNING AT RED HEAT, steel several inches thick is flanged over by power roller at left

Glowing steel is spun on gigantic lathes that stand on end

COVERING several acres of floor space is a metallic jungle of weird shapes: huge cast-iron domes and great disks of steel. As you step through the cindery dust, a warning klaxon sounds. Behind you, a hook glides by on a steel cable hanging from an overhead crane

A second hook descends behind it, both falling onto two girders joined with a tripod at their middle and counterweighted at one end. This is the peel, which picks up red-hot steel just as you might lift a biscuit with a fork. Only two cables control the peel and its dangerous load.

As the door of a furnace rises, the tines of the peel enter its white-hot maw, nudge beneath a disk or partly shaped head, and emerge with several thousand pounds of lethally hot metal. Again the klaxon sounds. The peel slides aideways, stops, advances toward an iron mushroom set in the world's largest spinning lathe (276 inches). The fork lifts, drops its glowing charge, nudges it straight, and retreats.

Four guides on diagonal tracks center the hot blank on the form. From above, a follower clamps down. The mass begins to turn, becomes a ring of fire. A roller, controlled by an operator inside a cage, emerges from the left. It acreams into motion on contact with the spinning metal. White sparks streak off as it bears down, forcing the edge over. On the floor the flanger, crouched down to see better, signals the operator. A second roller slides from inside the spinning bowl against its rim. The quadrant roller turns the edge under, both rollers withdraw, and the spinning dome rolls to a stop.

So a steel tank head is formed in the flanging shop of the Lukens Steel Company at Coatesville, Pa. It may be over 20 feet across and up to six inches thick. In many cases the work must be reheated several times or spun on successive forms.

When the head is cold, the center is punch-marked, a trammel point set in the dimple, and a motor-actuated head at the other end of the trammel rod switched on. It slowly swings an acetylene cutting torch around the rim, leaving a clean-cut, flame-polished edge.—Harry Walton.

Trials of the Jet-Age Traveler

IF YOU'RE one of the many who feel that an airline timetable is second only to an income-tax form in complexity, wait until you see a typical schedule for a jet transport. Flying around the world at nearly the speed of sound will throw your eating and sleeping schedules off as never before. To give you an idea of the problem, Boeing Airplane Co., Seattle, has worked out a flight schedule for a round-the-world trip on its near-sonic 707. (See table below.)

On such a flight, a passenger will fly through time zones faster than ever before. You can make the mental adjustment by simply resetting your watch while whizzing over the time zones of Paris, Beirut or Karachi. But your body doesn't change its routine so easily. On a jet trip, the people who live in the next city on your route may be quitting work when your body says it's time to turn off the alarm clock and greet the dawn. Your appetite says breakfast when it's really time for dinner.

The airlines are already anticipating these problems. They are planning their flights and meal service to cut down the conflict between their timetables and yours. However, there is no pat answer to the problem. Jet-age passengers will have to live through a little inconvenience. Says Boeing, "The long-distance

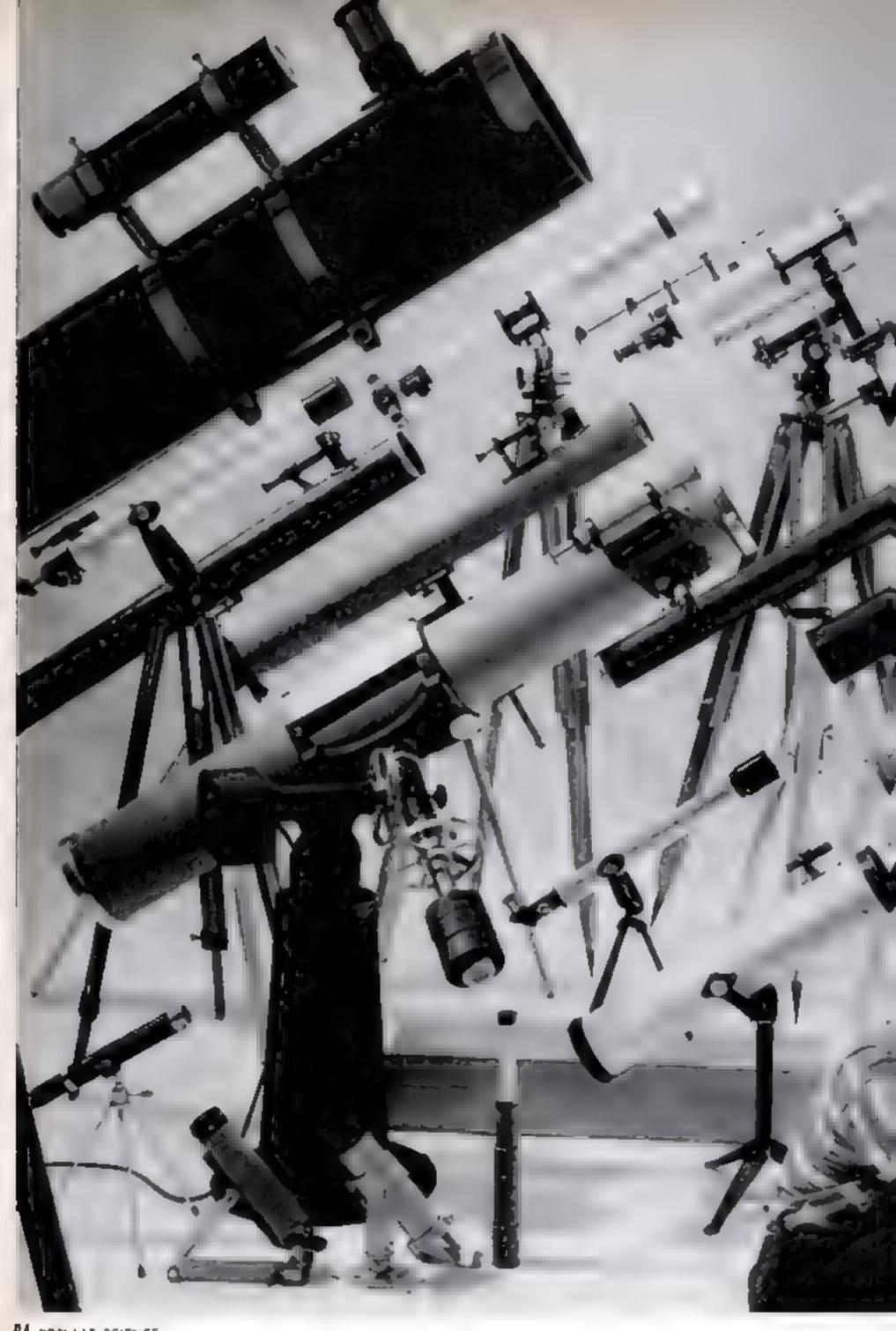
traveler must ignore his stomach—or the sun. Or he can go by slow boat."

Whether you fly eastward or westward, time somehow escapes you either way. From Seattle to New York to Europe and the Orient, the time zones will fly by at a great rate. You would see the sun rise three times within 48 hours, measured by your own local time. Going west you travel with the sun. Because of the 707's speed and the distribution of time zones you would lose only an hour every few thousand miles. You would see only one dawn during the whole trip.

But that's only the beginning of this 24-hour confusion. After leaving Paris going eastward, for example, a traveler's Saturday would last only 13 hours. Flying through a short Sunday would bring him to Tokyo. The departing day from Tokyo would be Monday. But Sunday would come back again as the traveler crossed the international date line over the Pacific Ocean on his return to Seattle,

Flying the other way, westerly, you find jet speed again making your watch virtually useless. A tourist could spend most of the day in Paris, and, flying on a 707, arrive in New York in time for dinner. Then, say he's going on to Seattle—a flight of a little over four hours. Leaving New York at 10:30 p.m., he would arrive before midnight.

EASTBOUND		WESTEOUND			
STOMACH TIME (Seattle)		ZONE TIME	STOMACH TIME (Seattle)		ZONE TIME
4 00 pm Friday	Ly Seattle	4 00 pm Friday	4 00 pm Friday	Lv Seattle	4 00 pm Friday
8 12 pm	Ar New York	11 12 pm	1 10 am Saturday	Ar Tokyo	6 10 pm Saturda
9 00	Lv New York	Midnight	5 00 am	Lv Tokyo	10:00 pm
3 10 am Saturday	Ar Paris	12 10 pm Saturday	10 09 am	Ar Saigon	2 09 am Sunday
7 00 am	Ly Paris	4 00 pm	11 00 am	Ly Sa gon	3 00 am
10 55 am	Ar Berrut	8 55 pm	4 16 pm	Ar Karachi	4 38 am
Noon	Lv Beirut	10 00 pm	5 00 pm	Ly Karach	5 00 am
3:40 pm	Ar Karachi	3 40 am Sunday	8 40 pm	Ar Beirot	5 40 am
5:00 pm	Ly Karachi	5 00 am	9 30 pm	ev Be-rut	7 30 am
10:18 pm	Ar Saigon	2 18 pm	1 25 am Sunday	Ar Paris	10 25 am
11 30 pm	Ly Sargon	3 30 pm	9 00 am	Ex Paris	6 00 pm
4 50 am Sunday	Ar Tokyo	9 55 pm	3 10 pm	At New York	6.10 pm
7:00 am	Ly Tokyo	M doight	7 30 pm	Ly New York	10 30 pm
4: 10 pm	Ar Seattle	4 10 pm Sunday	L1 42 pm	Ar Sauttie	11.42 pm



\$4 POPULAR SCIENCE



Suddenly Everybody Wants a Telescope

Sales zoomed with the first Sputnik. Now an age-old hobby may become the latest fad

By Hubert Luckett

HERE is a new hankering abroad in the land—the itch to own a telescope. If you are a fan of amateur photography, ham radio, hi-fi, or model railroading, you are particularly susceptible. Actually, this delightful affliction has been around for a couple of centuries. But only since the Sputniks first flew has it shown promise of becoming epidemic.

As in any hobby that involves buying precision equipment, there are pitfalls awaiting the newcomer to telescopes that can be expensive and disappointing. Here are the facts you should know before you lay your money on the line.

Satellite caution. Scopes are fine for watching a satellite if you're talking about the old-fashioned, natural moon. But don't expect a close-up look at man-made satellites. You just can't aim a high-powered telescope with its limited field of view at a rapidly moving satellite and track it.

What do you want it for? The answer goes a long way toward determining the scope you want. There are two general

relescopes GALORE—yet this is only a sample of what's available. Prices of instruments shown start at around \$30 for a spherical reflector of 3½" aperture and run to \$475 for a 6" reflector with pedestal and motor drive. Other typical prices: 4" reflectors, \$50 to \$80; deluxe 4" reflector with motor drive, \$200; 2" to 2½" refractors, \$40 to \$125; 3" refractors, \$125 to \$435. Telescopes shown here are distributed by Criterion Manufacturing Co.; J. W. Fecker, Inc.; Edmund Scientific Co.; Unitron; Bausch and Lomb; Skyscope Co.; and Lafayette Radio.

Distance may lend enchantment, but a bigger thrill is

types: 1) spotting or viewing scopes, 2) astronomical telescopes. Viewing scopes, sometimes called terrestrial telescopes, are for earth-bound looking—checking targets, bird watching, hunting and general scenic exploration. They give an image that is right side up. (They can be used for stargazing, too, Craters on the moon, Saturn's ring or perhaps the moons of Jupiter are some of the fascinating sights that may be seen.)

But if you want a really good look at the wonders upstairs, you'll need an astronomical telescope with a proper mount. The upside-down image that you get with it makes no difference when you're looking at stars or planets, but the simplification this allows in the optical system gives you more see-ability for your tele-

scope dollar.

Two basic types. Telescopes have either a refracting or a reflecting optical system. The refractor is what most people visualize as a telescope; the familiar spyglass is an example. The work of collecting light from a distant object and producing an enlarged image is done wholly by lenses. The primary image is formed by bending—refracting—light rays as they pass through the objective lens at the big end of the telescope. When you look through the eyepiece lenses at the small end of the telescope, you see this image enlarged.

Reflectors, though less a part of every-day experience, have much to recommend them. (The 200-inch telescope at Mt. Palomar is one.) In the classic Newtonian reflector, the image is formed by reflection of light rays from a concave mirror at the bottom (closed) end of the telescope tube. A small mirror or prism near the open end reflects the rays to the eyepiece mounted in the side of the tube (and near the open end). While the Newtonian is by far the most widely used by amateurs, there are other more sophisticated types, as well as hybrids that use both lenses and mirrors.

Well-made instruments using either mirrors or lenses can do a good job of fulfilling the chief functions of a telescope:

To give a magnified image of the object viewed (magnifying power)

To gather more light than the unaided ed eye (image brightness)

To give distinguishable images of

two points separated by only a small distance (resolving power)

Power may seem to be an important statistic, but with telescopes it is nearly meaningless as a method of deciding value. A 100-power scope may be overpriced at \$4.98 while a 20-power job could easily be a bargain at \$40. (Power, incidentally, means magnifying capacity; a power of 60X indicates that the image you see in the instrument is 60 times larger than the object appears to the unaided eye.) Power is determined by dividing the focal length of the objective lens by the focal length of the eyepiece. If the focal length of the objective is 30 inches and that of the eyepiece is half an inch, the power is 60X. Obviously, you can change power simply by changing the eyepiece. In better instruments, the eyepieces are interchangeable so you can choose the most suitable power for the job at hand.

Image brightness is one limitation on the magnification that can be used. When the power goes up, the brightness goes down, if you keep the same objective.

If you want to compare two instruments on this score, focus a telescope on a distant object and then swing it to point at the bright sky. Back away from the eyepiece several feet and you will see a bright round disk of light that seems to be suspended in the air just in back of the eyepiece. This is the exit pupil of the telescope. If you measure its diameter, you'll find it is equal to the diameter of the objective (aperture) divided by the magnification. The size of this disk indicates the relative brightness of the image.

Sharpness of the image determines how much fine detail you will be able to see. This depends first on the quality of the optics in the instrument. Assuming equal quality of two telescopes, theoretically the one with the larger aperture will distinguish more detail. This is the effective diameter of the objective lens for refractors, or the main (concave) mirror for reflectors. The measure of this ability to render detail is the resolving power—the smallest angular distance separating two points that will still give separate, distinguishable images.

Aperture, then, is obviously the proper way to rate a telescope. With either re-

a close-up of the heavens

fractors or reflectors, this dimension really determines final performance.

The maximum magnification you can use with a given aperture is subject to some dispute among experts. Some say that 30X for each inch of aperture is about all you can count on. Others claim that under ideal "seeing" conditions, useful magnifications up to 70X or even

100X per inch are possible.

The problem is similar to that of watching a big-screen TV picture. You can see an apparently larger picture by moving closer to the set. But if you get too close, the picture will be less distinct than at some point farther away. You see the best picture when you are just close enough for the eye to resolve fully all of the picture information being presented.

In a telescope, the objective determines the total amount of picture information. The eyepiece simply enlarges the image the way you do when you move closer to a TV set. The eyepiece cannot add to the total amount of picture information.

How do the two basic telescope systems stack up on this all-important factor of aperture? On cost, the reflector has the edge. You can get more aperture per dollar in a reflecting telescope than in a refractor, which helps account for its popularity among amateurs. The refractors cost more for the same optical performance, but they offer advantages in convenience and ruggedness. You can also get a wider field of view with a refractor.

Aperture size fixes the limit of performance, but the optics must be accurately made and the inherent shortcomings corrected, if a particular instrument is to deliver up to this limit. In a refractor, for example, this means the objective lens must be achromatic—designed to bring all visible colors to the same focus. Reflectors do not have this problem, being intrinsically achromatic. With any instrument the eyepiece should be achromatic.

Light is lost by reflection at each glassair surface in the lens of a refractor and some is absorbed in passing through the glass. Loss by reflection is reduced in any good modern refractor by anti-reflection coatings. You can spot a coated lens by the dull bluish cast to its surfaces.

Light loss in a reflector is determined

[Continued on page 232]



ALTAZIMUTH MOUNT provides independent motion in both vertical and horizontal planes. But it must be moved in both directions at once to follow the path of a star as the earth rotates.



EQUATORIAL MOUNTS with the polar axis set parallel to the earth's axis can keep a star in view with movement in only one direction. A clock drive can match the earth's rotation.

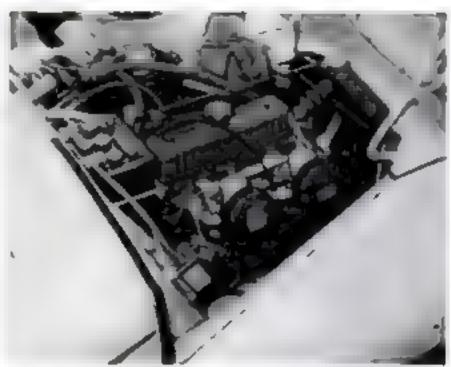
What You Can See

Our own moon is the first thing you'll want to observe. Even a modest 1" scope at 20X magnification will show hundreds of surface details. But, to do justice to these sights, you'll need a 3" to 4" telescope. With it you can explore mountain ranges with peaks higher than Everest, vast plains, craters and the lunar "seas."

The planets Mars, Venus, Jupiter and Saturn are favorite targets. You will see these as disks with a 1" to 2" scope, as well as such details as the changing phases of Venus, With 2" to 3" instrumenta you can make out some of the markings on Jupiter and see four of its moons. Saturn's rings will be clearly visible. Telescopes 4" to 6" will bring out the white polar caps and the gray-green markings on the red planet, Mars; separate the rings of Saturn, show several of Saturn's moons and let you see the shadows of its moons glide across the face of Jupiter.

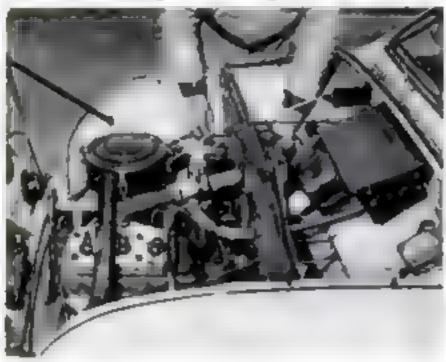
Driver's report on

Saab and Volvo



VOLVO'S FOUR-CYLINDER ENGINE, shown above, has two carburetors. Like the Saab, it features a "window blind" air cut-off for fast warmups.

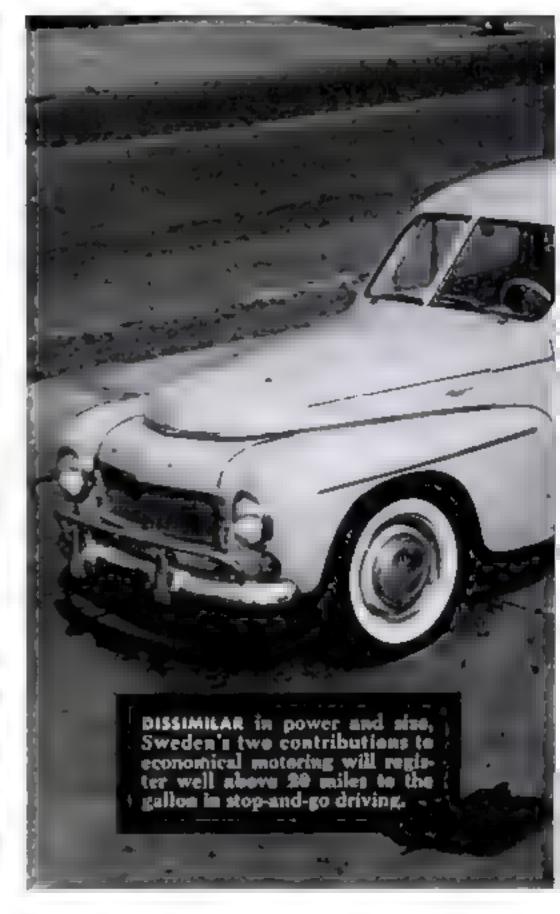
\$AAB'\$ CANTED, THREE-CYLINDER ENGINE is at extreme front of the engine compartment. Radiator and cooling fan are against the firewall.



By Devon Francis

WO brands of economical automobiles from Sweden have begun to endear themselves to U. S. motorists—along with the score of other European imports. In the order of their popularity over here, these cars are the Volvo and the Saab. In design and performance they are poles apart.

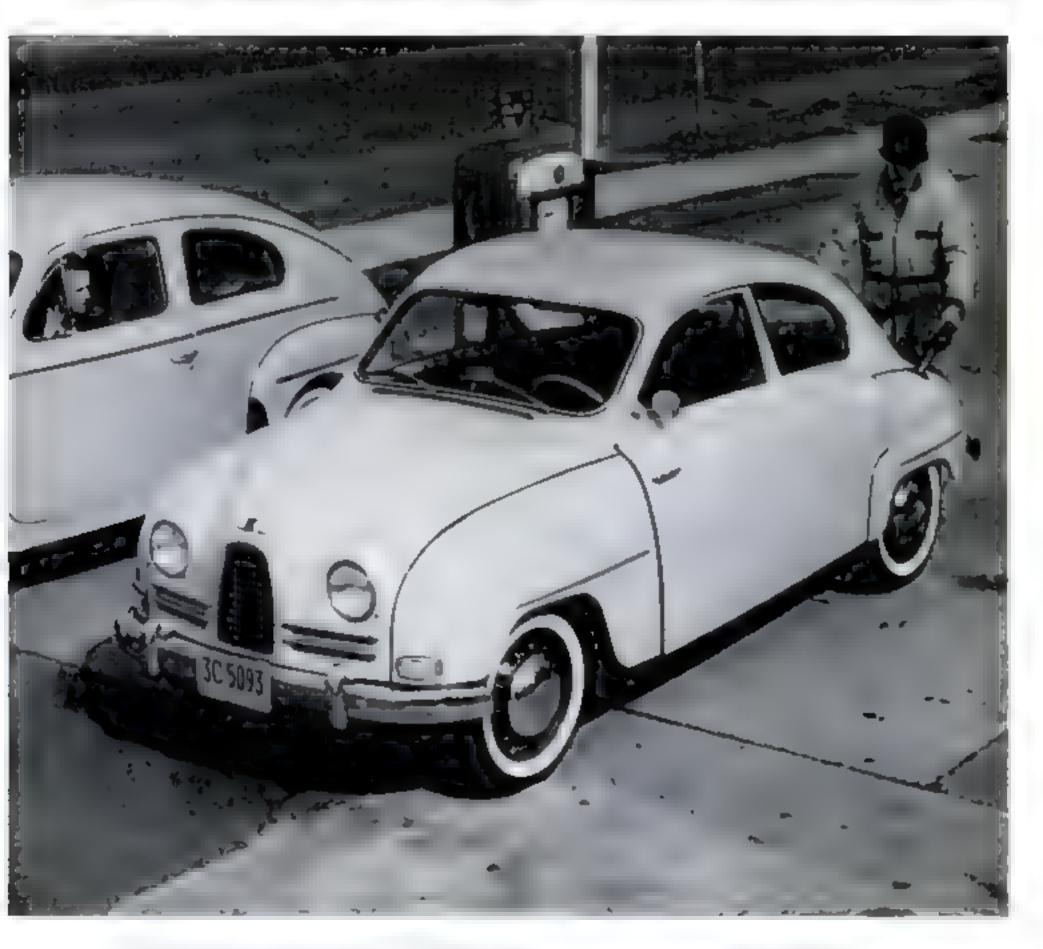
The Volvo is a conventional two-door sedan with a four-cylinder, 85-horsepower, overhead-valve engine under the hood.



The Saab is unique among the world's production automobiles. It, too, is a two-door sedan. But it's powered by a three-cylinder, two-cycle, 38-horsepower engine with, like most marine outboards, cylinder-wall ports in place of poppet valves. Its displacement, in fact, is little more than that of an outboard of about the same power.

The front wheels of the Saab, not the rear ones, are the driving wheels. Few front-wheel drives have been seen on U.S. highways since the Cord vanished.

...two little cars with a Swedish accent



The Volvo and the Saab are dissimilar, too, in performance and price. They do have a few characteristics in common.

Both run on pennies. They are well constructed and come surprisingly well equipped (by U. S. standards) for European machines. Both tote four persons. Both have high power outputs for the size of their engines. In American sports competitions for stock cars, both have won handily many events in their respective classes.

Here's what they are like:

Volvo PV444

This car is an almost unqualified delight to drive. Its engine is eager and obedient. It produces .87 horsepower for each cubic inch of displacement. Chevrolet's best 1958 engine produces .72 hp., Ford's .80 and Plymouth's—except for the esoteric Fury model—.71.

The clutch is smooth. The transmission-mounted shift lever moves crisply from one gear to another. Second gear is a real utility gear and a joy in traffic. A short wheelbase (though the Volvo is







Wheribase		102 5 m.
Length as		177 m.
Waith	***************************************	62 5 in
Height was a second		60.2 sn.
Weight	11	2.140 16
Performance 0.50 (indicated)		IL9 sec.
Q-60 (indicated)		17 sec.
Top speed (indicated)		92 m p h.
Speedometer error at 60 m.		35 high
Fuel consumption, slap-and		1.9 m.p.g.
Kual consumption, constant	50	36 m. p.g.

Price (East Guast port of entry)

\$2,238

ruel consumption, con	stant 50 50 m.p.g.
Specifications	
Engine	Levi OHV
District Control of the Control of t	97 сы на
Нэтверомег	85 at 5,500 e p m.
Torque	87 at 3 500 r p m.
Bore & stroke	3.125 in x 3 15 in
Compression	8.2
Transmission	3-speed manual
Axle ratio	- Fra 1
Brake lining area	141 f eq in.
D	
Passenger space	80.7 (1.)
Front-seat wirth	20 7 in (each)

Frant-seat witth	20 7 in (each)
Front leg room	12 f in.
	36.7 in.
	42 5 гн.
Rear leg room	38 in.
Rear head room	.36 гд

bigger and heavier than the bulk of today's imports) gives it the customary European maneuverability.

The Volvo has a low noise level. Its entrance room is excellent, its head room greater than in any current U.S. car. The seats fold flat for sleeping two.

Like all cars, the Volvo has its debits. The styling is out of the late 1930s in the U.S., right up to its two-pane windshield. The body's sloping "fast back," combined with small rear-quarter windows, affords poor rear visibility.

A transmission tunnel that is 9½ inches high where the shift stick is mounted interferes with the accelerator toe. The heater on the car tested was only a marginal performer on a cold day. The car's cornering is excellent but (of course) the springing is pretty hard.

The engine is a stubborn cold starter. Engine vibration is excessive at idling speed. The body drums in second gear at 37 miles an hour. First gear needs synchronizing.

The panel is fully instrumented and well lighted, but after dark the controls on its bottom edge have to be located by feel.

The price makes the Volvo competitive with unadorned, stick-shift Chevies, Fords and Plymouths. It is considerably costlier than the Rambler American or the Studebaker Scotsman. Only 12,000 Volvos were imported in 1957. Some 15,000, all of which no doubt will be snapped up, will arrive this year. More than half the Volvos brought over are sold in California.

Saab 93

The Saab (a contraction of Svenska Aeroplan Aktiebolaget) was described in the June, 1957, issue of POPULAR SCIENCE as "astonishingly stable." It is, It's a lot more.

The Saab engine—which produces .82 horsepower per cubic inch—has less than half the displacement of the Volvo's, and the performance reflects it.

The car can be driven all day, without damage, with the accelerator on the toeboard. The front-wheel drive provides directional stability even when the going is slick, and the weight distribution obviates any need for putting concrete in the trunk for winter traction. Clutch and brake operate easily. A free-wheeling control, standard equipment, saves fuel on the open road and permits shifting without the clutch. The Saab pays no mind to winds lower than gale force.

The passenger compartment floor is flat—no transmission tunnel. Both front seats, exceptionally comfortable (like the Volvo's), have twice the normal fore-aft travel. Seats are available that fold down to sleep two. There are

little refinements, such as a flasher on the panel that warns when the gas tank is down to two gallons.

The Saab has won what the aficionados call competition "rallyes" in this country with depressing regularity for the last couple of years.

The Saab's owners are passionately devoted to it, and criticism of it invites mayhem. None-

theless, it has its faults.

The engine's torque output is skimpy. Second gear, necessarily much used in small cars, has little authority under 20 miles an hour, "Fast" steering with that weight on the front wheels makes women puff over the parking effort.

The necessity to add oil to the fuel complicates ministrations at the gas pump. Non-additive oil must be used—today's detergents visit ills on the engine—and the oil must be measured in a ratio of one part to 25. It's best to fetch along your own S.A.E., 40 in a can specially

graduated at the pouring angle.

Clouds of blue smoke from the tailpipe on cold starts may curl a frau's lip, especially if a neighbor is looking. The engine sputters and har-rumphs on the over-run, and to the uninitiated its gasps are unnerving Cylinder heads and cylinder-wall ports must be scraped free of carbon every so often at a cost of \$5 and an hour's time. The owner's manual says each 15,-000 miles, the import office each 30,000 to 50,-000. Take your choice.

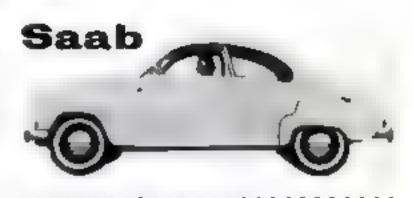
Like the Volvo, the Saab would never win a beauty contest before a panel of Detroit judges. It, too, has a "fast back" and limited rear visibility. Forward visibility is excellent. In place of vent windows, it has plastic deflectors at the top trailing edges of the door panes. This works fine for the front-seat passengers but is brutal

on those behind.

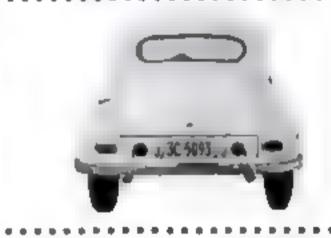
The springing is hard. Shifting is easy, but the high lever position on second gear is annoying. The directional signals do not cancel. The obtrusion of the front-wheel wells into the driving compartment forces the driver's left leg to assume a starboard list to reach the clutch. The transmission whines below 30 m.p h. The first gear needs synchronizing when the free-wheeling unit is inoperative.

As yet, the Saab is sold only on the northeastern seaboard, as far south as Washington, D. C., as far west as Illinois. Last year 1,400 Saabs were sold in the U.S., and the prospects for 1958 are for 4,000. END

NEXT MONTH: What's Detroit planning for 1959? Are the auto makers actually getting ready to manufacture small, European-type cars? For the answers, see PS for June.







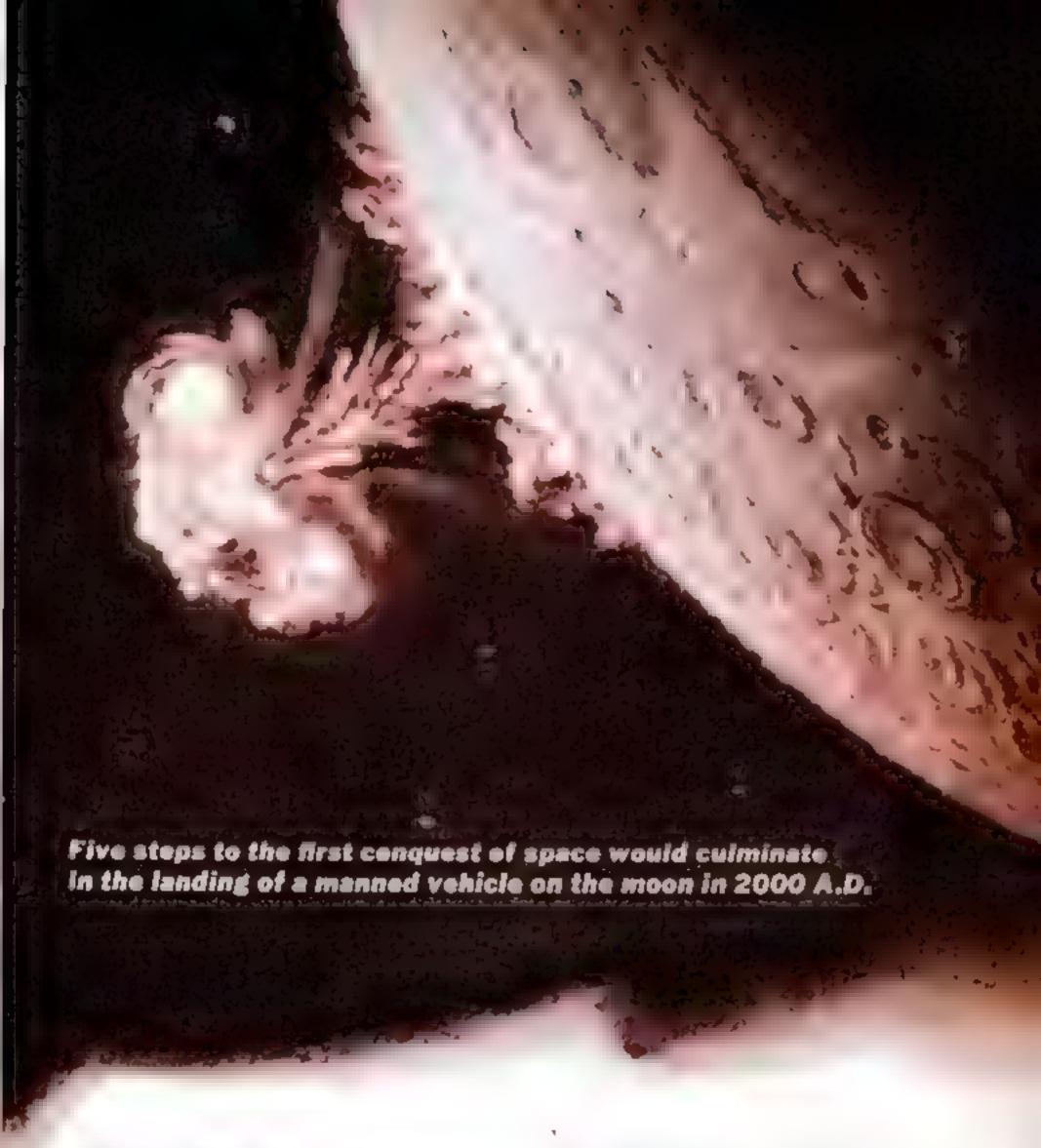
Price (Enst Coast port of entry)	
Performance	
0-50 (indicated)	ŀ
0-60 (indicated) is seen as 31 sec Top speed (indicated) is 72 m p.b	•
Speedometer error at 60 m.p.h	,
Fuel consumption, stop-and go	
Fuel consumption, constant 50 38.2 m.p.g	
Specifications	
Engine 3 cyl 2-cycle	
Displacement	4
Horsepower38 at 5,000 r.p.m	٠
Torque	-
Bore & Stroke	
Transmission	ì
Axle ratio man	
Brake-lining area	
Passenger space	
Front-seat width	
Front leg room	
Respect width48.5 in	
Rear leg room	
Rear head room	
Atom prose and an anatomical anatomical and an anatomical ana	*

U.S. scientist proposes a realistic new

Timetable to the Moon

ARMED with an atomic bomb,

the first rocket will crash on the moon. . When the lunar dust is highest, the second rocket will sweep in from the sky, skim down close to the moon's surface, and scoop up material in the dust cloud to return it to earth for analysis.



By Dr. I. M. Levitt

there tal the few Point arran of the Frank in Institute

In TONIGHT'S sky is a target—a round, silvery object some 240,000 miles away. It is large—2,160 miles in diameter. When examined with a telescope it is seen to be quite rough. We call it the moon

For thousands of years man has dreamed of going to the moon. Today that dream is almost a reality. Many of the older people and all of the young who

read this will be around when a human being lands on the moon. This will take place by the year 2000 A.D.—give or take a few years. It may be longer if wars intervene to halt the rapidly accelerating technological advances. It will be shorter if a technological breakthrough like a nuclear-powered rocket materializes.

Manned flight to the moon cannot be initiated as a project in the immediate future. A tremendous volume of preliminary work must be completed first. Before we can think of landing on the moon

it will be necessary to establish a manned space station circling the earth as a base

of operations.

There are steps, however, that can be taken in the immediate future—any moment now The first is simply to aim a "something" at the moon and score a bull's-eye. This is not a difficult task if one has the tools to build, aim and guide the "something."



1958-1960: Marking the moon

The first man-made object to land on the moon will be a "marker" to tell scientists how close they have come to getting on target. It may be a container of fine glass beads, white powder or even a fluorescent dye blown apart by TNT.

There could be scientific benefit from this shoot—a more precise determination of the lunar mass. Accurate tracking of the rocket would help determine the moon's pull at points along its path. From this information would evolve the mass of the moon.

A 30-pound payload would be necessary for this. If we assume that for every pound of payload delivered on the moon about 2,000 pounds of fuel and hardware are needed, we require a rocket with a total weight of about 60,000 pounds.

This three-stage rocket would stand about 80 feet high, with the first stage slightly over 55 inches in diameter.

While this is a theoretical rocket, the

Lockheed Missile Systems Division has fabricated a practical system. Their X-17 is a three-stage rocket capable of a speed of 24,000 feet per second. If this were scaled up, one more stage could add the extra 11,000 f.p.s. necessary to hit the moon.

Guidance for this marker system is not difficult to achieve. An ICBM guidance system, to perform satisfactorily, must possess a tolerance of a few tenths of a degree. But in aiming a rocket at the moon the error could be as large as half a degree! Thus in the guidance component of an ICBM we would have the guidance

to put a payload on the moon.

Directional guidance is not the only problem, however. There is the question of proper speed at the cut-off point where powered flight ends and the rocket is to coast onward—or, as space planners say, is to be "injected"—into a lunar trajectory. George H. Clement of the Rand Corporation has investigated this aspect and his conclusions indicate that the cut-off speed must be rather precise.

At 350-mile altitude, which he assumes for the cut-off, or "injection," point as a basis for calculation, escape velocity from the earth is 35,165 feet per second (about 24,000 miles an hour). That is, a rocket reaching this altitude at more than this speed would escape from the earth and

circle the sun.

To project a payload from 350-mile altitude to a range of some 240,000 miles, the distance of the moon from the earth, a cut-off speed of 34,850 f p.s. would be needed—a trifle less than the absolute escape speed. This velocity goes down slightly, to 34,800 f p.s., if the moon is there to serve as destination; its gravitational field accounts for the difference of 50 f.p.s.

Actually the permissible variation in speed depends upon the precision of the angle of injection into the lunar trajectory. At best, the cut-off speed must be

The Moon as a Military Base

Pentagon planners are already calculating the wartime advantages that could result from control of the moon. They would be considerable.

According to Air Force Brig. Gen. Homer A. Boushey, established outposts on the moon, armed with missiles, could have these vital strategic values:

1. Missiles aimed toward the earth from the moon could be watched and guided all the way from a single tracking station. But the opposite would not hold true, because of the earth's rotation.

The nation maintaining a military base on the moon would have excellent protection held within 50 f.p.s., or about 1/7 of one percent, of the intended figure.

The time needed to reach the moon is critically tied to this velocity. If the rocket leaves the assumed injection altitude with a speed of 34,800 feet per second, assuming zero error in the injection angle, the travel time will be slightly more than four days. If the velocity goes up to 35,000 f.p.s., time is cut to $2\frac{1}{2}$ days. If the speed is 35,500 f.p.s., it's $1\frac{1}{2}$ days.

The problem of seeing a marker on the moon is made difficult by our turbulent atmosphere. Atmospheric shimmer and distortion preclude the certain identification of most existing surface details less than one mile in diameter. This does not mean, however, that a man-made mark would have to be that big. Brightness—reflectivity—of the spot created by our fluorescent powder or glass beads would be an important factor. The minimum diameter of a spot we could observe with our 10-inch refractor at the Franklin Institute Observatory would be about 700 feet. But if we could use the 200-inch Hale telescope, a marker 35 feet in diameter could be seen. Thus the size of the spot to be seen depends on the aperture of the telescope used.



1962: A-bomb on the moon

The exciting next step will come a short time later when an atomic bomb is exploded on the moon. This payload

weighs between 60 and 100 pounds. Using the same hardware-to-payload ratio, this three-stage rocket must weigh over 100,-000 pounds. The rocket may be 100 feet high and the diameter of the first stage will have to be increased considerably to house the additional fuel.

An atomic-bomb explosion on the moon would be visible to the naked eye of an observer on the earth. The intense energy of the bomb explosion would vaporize several thousand tons of the lunar surface to incandescence. Scientists on the earth could record the spectra of the explosion to determine the elements in this layer of the lunar surface. Thus some of the constituents of the lunar surface will become known.

Astronomers have considered the surface of the moon to be covered with a layer of dust or powder five or six inches thick. Our knowledge of its surface can only be derived from the study of reflected sunlight. The lack of any appreciable atmosphere on the moon precludes erosion by rain, wind and snow. But erosive effects are present.

The monthly changes in the temperature of the moon in going through a variation of several hundred degrees, the chipping away of the lunar rocks by the rain of meteors, the rapid change in temperature—from 160 degrees F. to minus 110 degrees F. in an hour—during a lunar eclipse, contribute to the wearing down of the rocks to create the dust that covers the lunar surface.

It is this complex dust that the astronomer would like to analyze. An atomic explosion on the moon might permit astronomers to verify their speculations.

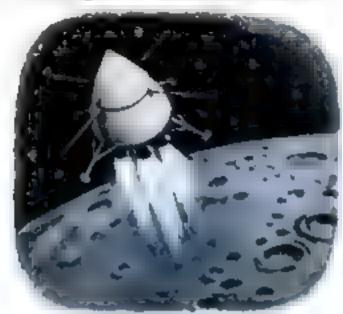
An atomic bomb set off on the moon will dig a crater of large diameter—larger, because of the reduced gravitation, than it would on earth. The debris from the crater scattered over the surface of the moon will form a new spot perhaps a mile or more in diameter. This will be visible

against surprise attack. Reason: If the moon base were attacked first, missiles would have to be launched several days in advance, with resultant loss of surprise. If the attack were made on the earth first, the moon base would be unharmed and ready to provide retaliation.

S. Additional advantages of a permanent military base on the moon would include

excellent earth surveillance; lessened gravity (an aid in launching missiles at the earth); virtual absence of atmosphere, reducing the blast effect of countermissiles; and the possibility of locating launching sites on the far, or shielded, side of the moon.

These considerations by the military planners are something to muse about the next time you see the moon riding the sky. through a big telescope even though special markings have not been used.



1968: Instruments on the moon

The next step is the landing of an instrumented payload on the moon. In his paper for the Rand Corporation, Clement has also explored this possibility. He visualized the payload as consisting of 50 pounds of instruments and 50 pounds of power supplies for the instruments. This payload has to land safely on the lunar surface—to bring it down in a crash landing would surely destroy the instruments. For a 100-pound payload about 550 pounds of rocket must be used to brake the fall. Thus the total payload for a device of this type is 650 pounds.

To put this on the moon from the surface of the earth will require a 175-foot rocket of three stages, with the first stage about 14½ feet in diameter. The all-up weight of this rocket will be close to a million pounds.

Instruments placed on the moon 240,000 miles away will relay to the earth
precise knowledge of the lunar surface.
One instrument will measure lunar gravity. This can be done two ways. One is
measuring the time it takes for a known
mass to fall a known distance; the other
uses the period of a swinging pendulum.
With these relatively easy methods the
gravitational field of the moon can be determined to one part in a thousand.

Scientists believe the moon must have a magnetic field. Whether this is true can also be determined instrumentally.

The use of a lightweight mass spectrograph could result in knowledge of the atmospheric density, if an atmosphere exists on the moon. If it does, astronomers believe it is less than 1/10,000 as dense as the earth's. Measurements of the density could go far below this limit.

Simultaneously with the efforts to land an instrument payload may come reconnaissance programs. In these the moon will be circled by rocket ships that will return to the vicinity of the earth. Many scientists have proposed such reconnaissance vehicles but one of the most sophisticated designs comes from Krafft A. Ehricke, of the Convair Corporation (PS, March).

His moon-circling rocket would exceed 100 feet in height and weigh 240,000 pounds. He visualizes it as a reconnaissance vehicle with pictorial information as the principal objective. Payload would weigh between 400 and 800 pounds and would include guidance equipment, a television camera, and radio gear. The first objective will be a photo-reconnaissance of the lunar surface including the other side of the moon. If this materializes, the astronomera will be able to compare the moon's two sides—the one we always see and the one we never see.



1975: Lunar dust brought to earth

There is an extension of this reconnaissance vehicle that may give scientists a precise idea of lunar surface characteristics. The program involves the use of two moon-rockets taking off for the moon, one right after the other. The first rocket, programed to crash on the moon, is armed with an atomic bomb. When the bomb goes off, a tremendous amount of surface material will be blasted high into the lunar sky—higher than on earth, for the gravitational field of the moon is but a sixth of the earth's.

When the lunar dust is highest the second lunar rocket will sweep in from the sky. This rocket is programed to skim down close to the surface of the moon and scoop up material in the dust cloud.

[Continued on page 246]



X-ray diagnosis is now widely used by veterinarians. Here Dr. Whitney checks a healed leg.

What Science Has Done for Your Dog

A dog's life is a better one —longer and healthier, too—thanks to veterinary research

By Dr. Leon R. Whitney

FEW decades ago, the average dog lived about three years after weaning. Then some "mysterious" disease struck him down.

Now, in my veterinary hospital in Orange, Conn., it is not unusual to see 19-year-old patients. Teen-age dogs appear every day. Thanks to modern science, the pup you buy for your toddlers can be expected to grow up with them.

That's a far cry from the experience of my own generation, when most children loved and lost several dogs during the years of their own adolescence. Along with the use of dogs in medical research has come a great advance in the treatment of dog ailments—and a boost in the life expectancy of our canine friends proportionately more than equal to that of our own.

The mysterious disease that killed so

MAY 1958 107

many dogs in past years was called distemper, which simply means illness. Laymen still use the word to describe anything from the sniffles or a hoarse bark to convulsions. But science discovered that distemper might be any of at least 12 different diseases, each with quite different symptoms.

Today, if you take an ailing dog to a veterinarian, he should make tests that

enable him to say definitely, "This is infectious hepatitis," or coccidiosis, or just a case of hookworms. as the case may be. He should also be able to save the animal, for only four of the 12 "distemper" diseases are likely to be fatal nowadays.

It shouldn't happen to a dog, for these four killers can be prevented by vaccination. They are teptospirosis, Carre's disease, hardpad disease and, in puppies, infectious hepatitis (not to be confused with the human disease). There is no excuse for letting your dog contract them. Vaccine for the three last-named can

be administered simultaneously when a pup is eight weeks old. The leptospirosis vaccination should be done at the age of four months. (Basic research on the vaccine for Carre's disease, incidentally, laid part of the groundwork for that on police vaccine.)

Antibiotics and sulfa drugs are helpful in treating most of the other distemper-complex diseases. These drugs

were first proved in treating human diseases, so that—to turn the tables—in this instance man served as guinea pig for his best friend.

Gone are the dog days, those summers through which our pets scratched until they bled, bit tail and flanks or rolled velping in the grass. Fleas or mange made the dog of yesteryear an unhappy beast, and the powders or lotions offered

> for treatment of these troubles were both obnoxious and worthless.

> If a dog developed "red mange" or sarcoptic mange, most vets in those days destroyed him as a hopeless case. Today the cure of these "incurable" diseases is comparatively simple. Rotenone, which is also an insecticide. is the commonest specific used.

> Dogs used to suffer much from fungi and bacterial infections of the skin, for which there was no remedy. Now effective medication for these can be obtained in almost any drug store. Some remedies contain malucidin, a

powerful new antibiotic made from brewers' yeast. It's one of the safest and most potent destroyers of fungi and bacteria yet discovered. Selenium sulfate and cadmium sulfate also are effective when used in the bath.

Fleas are outdated. The new bug killers like chlordane, malathion and peperonal butoxide make it needless for any dog to be flea-ridden. Freeing your pet

Three ways to cure a dog of chasing cars



You may save your pet's life by training him out of the dangerous habit of assaulting auto wheels. Here are three methods that Dr. Whitney advises. You may have to repeat them several times.

1. Ride past in a friend's car. When the dog challenges the car,

jump out and switch him.

2. Carry a third of a bucket of water in the car. When the dog attacks the car, throw the water in

When the dog gives chase, pull slightly ahead and throw a torpedo firecracker in front of him.

How to pick a puppy and get him off to a good start in life

 Choose your pet from a long-lived breed (cocker spaniel, old-fashioned American fox terrier, collie, or any hound breed) and from a litter born of a long-lived ancestry.

Have the pup dewormed. Repeat the

treatment in 11 days.

At eight weeks of age, have the pup.

vaccinated against Carre's disease, hardpad disease and hepatitis. Repeat the first two at aix months' age.

Get the pup vaccinated against lep-

tospirosis at four months' age.

 Feed the pup two or three times daily until he is full grown at seven or eight of these pests will also cut down the likelihood of his getting tapeworm, for this is sometimes caused by the swallowing of a flea that has tapeworm cysts in its

body.

Ticks are the bane of dogs in the South, and the carriers of Rocky Mountain spotted fever, a killer of dog and man alike. In recent years, ticks have spread northward and could become a national menace, but for the timely development of chemicals that not only kill but repel ticks. In tick-infested areas, dogs should be treated with a powder or spray insecticide of this kind at least once a week.

Science has saved dogs from another old scourge—worms, which used to render them anemic, bleary-eyed, rough of coat, and finally convulsive. All worms were lumped under one diagnosis, and "vermifuge" was prescribed as the rem-

edy. It didn't work.

Research has since shown that there are several kinds of worms—hook-, round-, whip- and tape-worms, some of which call for different treatment than others. Whipworms, the most damaging infestation, can be eliminated today with a small dose of butylchloride every hour for five hours, with no physic following.

Hookworms and roundworms are treated successfully with the same drug or with tetrachlor-ethylene, a related chemical. So science has brought comfort and longer life to dogs through two common chemicals, originally created for com-

mercial purposes.

Other wonder drugs, from the standpoint of dog care, include heptaldehyde. which sometimes cures breast cancer in dogs. The study of this disease in our animal friends may help us master it in mankind. Science has also produced stilbestrol, a hormone that prevents conception if a bitch is accidentally bred, and so rules out the introduction of an alien strain into a pure breed. Drugs can artificially bring a bitch into heat, making it



THIS HANDSOME BEAGLE, son of a champion, was raised in a wire-bottom pen. Free of parasites and vaccinated against the common dog ailments, he should live 12 or more years.

possible to breed her at a time chosen by the owner

Perfected modern diets have perhaps done even more for the health and longevity of our dogs than therapeutics. Once it was believed that a dog could not digest fats and starches. Fresh lean meat was considered the ideal food. Today we know that fresh meat is not necessary. and we can feed our pets better at a fraction of the cost of such a diet. Actually, a dog has a better diet than many humans because his food is scientifically selected and, unlike a man, a dog takes what you give him.

Baked and canned dog foods contain all the protein to be found in meat, as well as important vitamins and minerals. They also contain high-calorie fatty acids and precooked cereals, which a dog can easily digest. By feeding your pet inexpensive, dehydrated dog food you can supply all his dietary needs. Keep him from foraging for food and stop him from chasing cars, and you will be able to keep your pet as a faithful companion

for many years.

months. Then feed only once daily, regulating your grown dog's weight by giving him about one-third less than he would eat. Don't give table scraps or tidbits except as training rewards.

 Have periodic examinations made and have the dog dewormed as necessary.

 Use insecticides with residual properties to keep off lice, fleas and ticks.

 Don't let him roam or forage. Spoiled food and wild rabbits are extremely dangerous edibles. Keep him away from mole and rat poisons, newly sprayed weed killers and insecticides.

 Train your pet to obey commands and serve you. Remember that he is a dog, not a human being. He will be happier and so will

you.



Army Jeep turns to skyriding. This new "Flying Jeep" will take off and land vertically, fly forward at 100 mph. It is propelled by two rotors-one in front, one behind. It was developed as the 59K VTOL by Prasecki Aircraft Corp. for the Army as a high-utility, general purpose III POPULAR SCIENCE



vehicle Designed for extreme low flying, it hugs the ground, will fly under bridges or telegraph wires and behind low objects for concealment. With no wings to interfere, it will go down narrow streets, between buildings and trees. Dual engines, rotors and controls are in its flat body.



Four-wheel steering. Commercial version of an Army machine (PS, Dec. '57), this tractor can run sideways on four oblique wheels Steering of the Napco Crab, controlled by knuckle joints, is done with front or back wheels. Front one way, rear the other, it turns in a 12-foot radius.



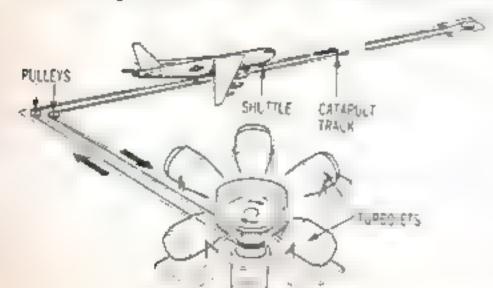
Nose funnel helps silence jet. By baffling air to the intake as well as from the exhaust, this French Boet silencer reduces noise in ground run-ups of jet engines. Shown in a test on the Super Mystere in this photo from Aviation Week, it cut the noise level 37 decibels. The rectangular window at front allows mechanics to align the suppressor.



Copter handles big moving job. A helicopter spots a 3,400-pound heating unit here on the roof of Convair's new Atlas missile factory in San Diego. Making 70 quarter-mile trips, it brought 100 tons of heating and ventilating equipment in six hours. Conventional methods would have taken four weeks, required reinforcing the building for rigging.



Jet-powered windmill launches big jets. This propulsion



unit for catapulting heavy jet bombers into the air from short flying fields is under test for proposed Air Force use, All American Engineering Co., the builder, says it will get five B 52s or B-47s and four tanker planes off in 15 minutes

Heart of the Turbo-Cat; six Allison J33-A16A jets whose exhausts spin a vaned wheel attached to a continuous underground cable riding in slots



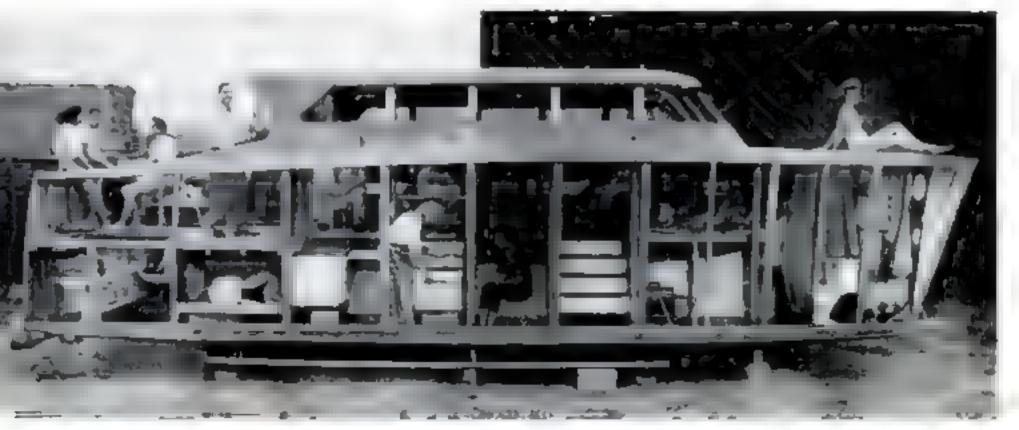
Piggyback trailer. Here is a mobile home that rides on top of its car instead of being pulled along behind it. Designed especially for camping trips, it has full-size adult beds on the lower level, bunks for youngsters on the upper, and room for luggage in the front. It is built in Australia for G. M. Vauxhall pickups, makes parking and reversing a cinch.

Life Inside hait a boat. The fullsize mockup below of only half a boat was assembled on the beach to show what goes on inside this 35-foot cruiser, one of the largest family outboards afloat.

The catamaran-like Sea Cat-35, shown cruising at right, rides on twin ski bottoms and is powered by two outboard motors aft of the cabin and below the rear sun deck. It has a main lounge, galley, bathing facilities and six to eight berths.

The Sea Cat-35 is made by Custom Hydrocraft of San Diego. It is available in plans, kit, partially built or finished.







PICTURE NEWS



Rocket-propelled torpedo. Here is one of the Navy's newest antisubmarine weapons. It is fired into the air by rocket drops into the water by parachute and finds its undersea target by use of an ingenious homing device. It extends a destroyer's "kill" area by many miles, enables it to sink a sub-while still outside the range of enemy torpedoes. The RAT (rocket assisted torpedo) is launched from short tracks at tached to the outboard edges of a standard five-inch gun mount slower

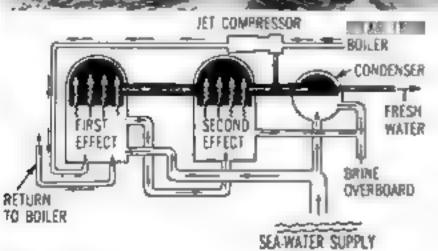
tached to the outboard edges of a standard five-inch gun mount clower left) and powered by a solid-propellant rocket engine that falls off near the top of the trajectory. The parachute drops it gently so as not to damage its sensitive mechanism. Rocket and torpedo are 16 feet long, the torpedo eight. The new weapon is already in fleet operational use.

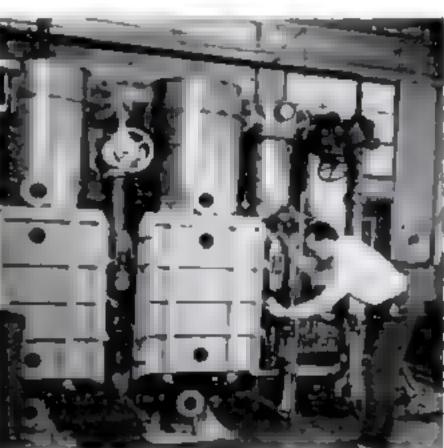
PICTURE NEWS



Barbers learn by shaving balloons. One little nick and the balloon heads on these barber chairs go pow, spattering barbers and the walls with lather. It's a method of teaching neophytes at Rome's barber school how to handle a razor without danger of cutting the customer.

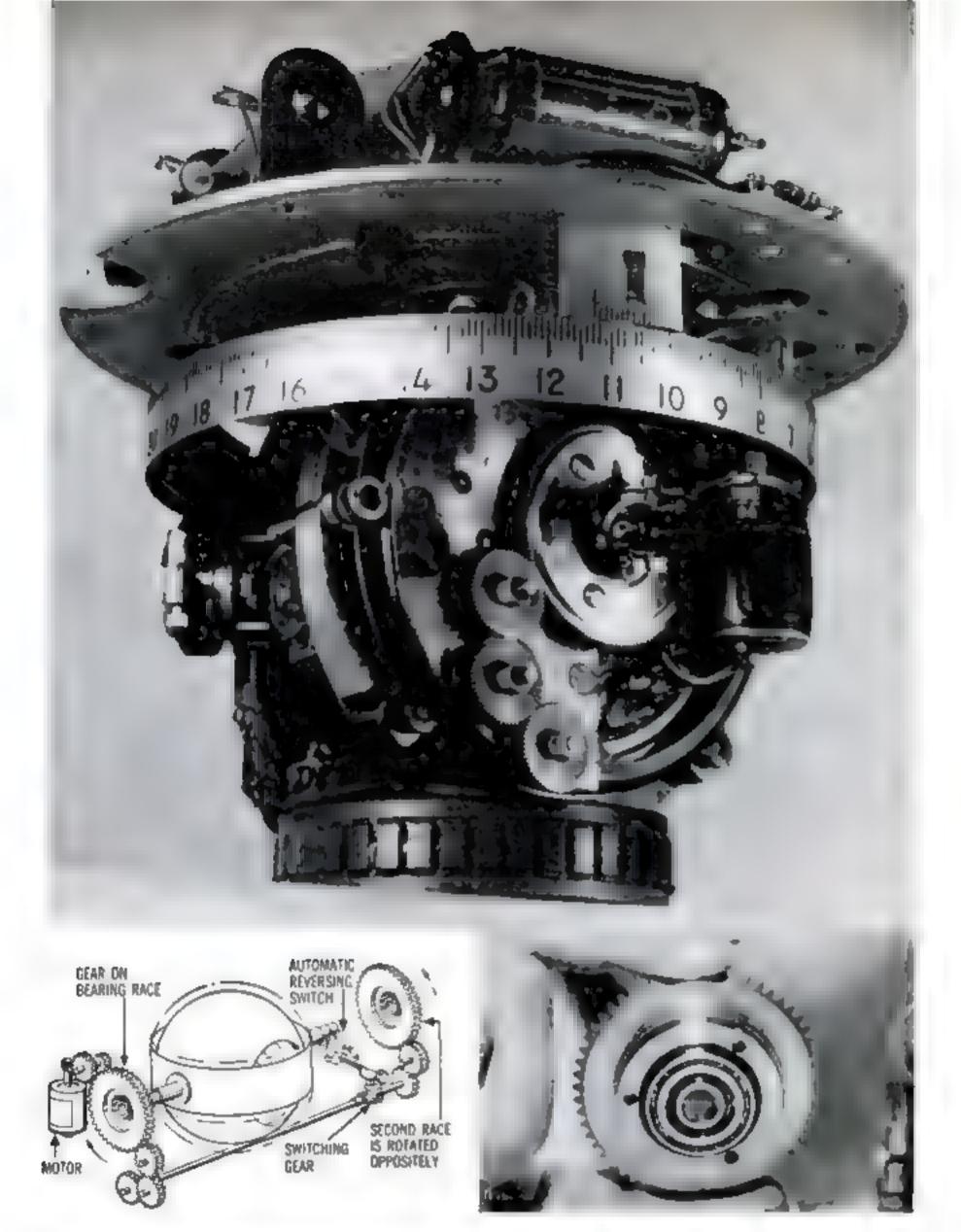




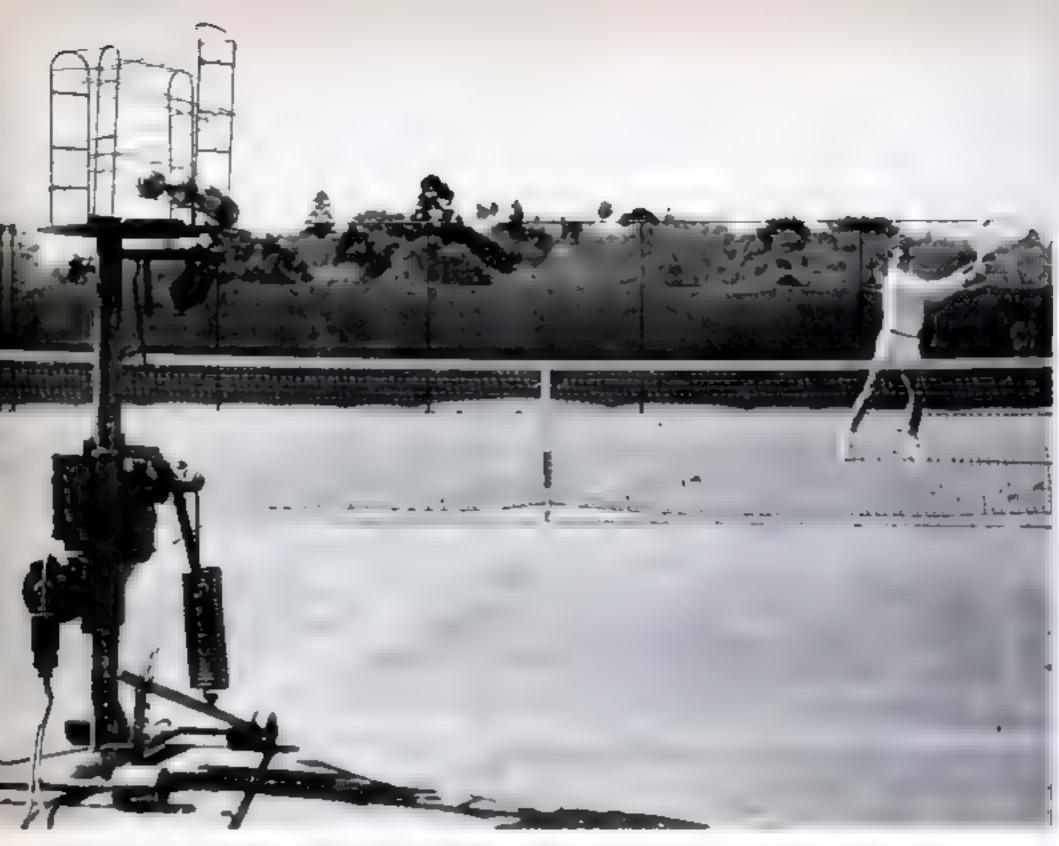


Fresh from salt water. This unusually economical still converts sea water into fresh, at as little as 20 cents per 1,000 gallons depending on local cost of fuel.

It works by evaporating sea water in two flash chambers, then sending the vapor through a condenser. The maker, Maxim Silencer Co., has plants going in Bermuda and the Virgin Islands.



Gear-driven bearings boost gyro accuracy. To cut drift error in gyroscopes due to microscopic bearing faults, Sperry Gyroscope has developed this new gimbal bearing. Called a Rotorace, it is driven by a tiny motor and consists of two races, one running inside the other. The motor revolves the two bearings in opposite directions at about 20 r p.m. for several turns and then reverses both for a like number of turns. This reduces static (breakaway) friction, averages out wholesale differences between the two bearings and cancels out minute irregularities within them. Drift rates are cut to as little as .05 degree per hour.



Robot serves tennis balls. Firing balls at the rate of 13 to 26 a minute, this machine can duplicate almost every stroke in tennis. It contains four striking heads fitting in a heavy coil-spring striking arm run by a 1-hp motor. It was invented by J. R. Black, formerly a well-known Australian player, and is used by schools, coaches and private courts in Australia. Six of the machines are now slamming balls in the U.S.

Rubber boat can't sink. A tough new blend of rubber and plastic makes the 14-foot runabout below virtually unsinkable. The same material, made by U.S. Rubber and called Royalite, is used in automotive parts. In the boats it's a five ply mold around a honeycomb center. Two boat makers, Crestliner and Wagemaker, plan models for summer,





Church designed in shape of fish. Here is a church that is really different. Its exterior lines take the form of a fish, early symbol of Christianity. The recently dedicated edifice is the First Presbyterian Church in Stamford, Conn., built of reinforced panels for a congregation of 800, and includes a parish unit and separate hall for public events. Its architect, Wallace Harrison, planned the United Nations buildings

Pint-size plane is low in cost. This little plane, named the Tipsy Nipper, is only 14 feet long and has a wingspread of 196 feet. It is powered by a Volkswagen engine, has a cruising speed of 66 m p h and a maximum range of 187 miles. Built by Fairey of Britain, it sells for \$1,000 in kit form. It's shown beside a Hawker Hunter jet fighter.





Tank is own trailer. When this 30,-000-gallon tank was delivered, it was temporarily turned into a vehicle. Steel cables lashed it to a dolly in the rear and to a flathed trailer at the forward end.



Radio plugs in ear. This tiny portable is carried where it does the most good right in the listener's ear. A German invention, it uses transistors and a miniature battery, has no connecting wires.



122 POPULAR SC ENCE



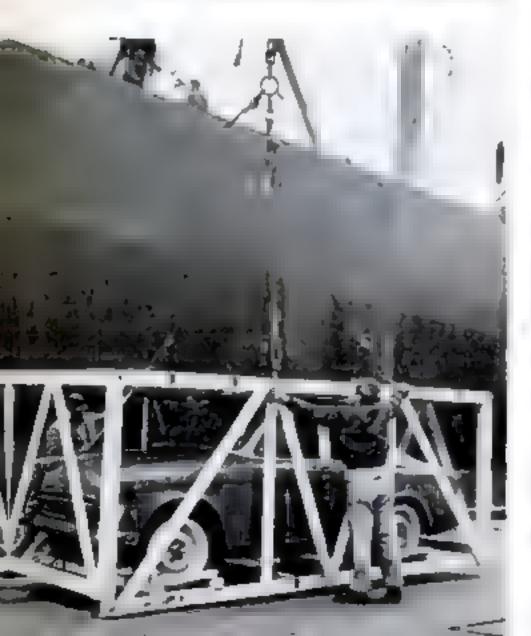
Prisoners' belt. Here's an idea that makes it hard to escape. The sherif's office in Buffalo, N. Y., put a loop in this belt through which handcuffs slip. It keeps a culprit from using cuffed hands as a club



GIS wear paper suits to fight fires. Carrying lightweight hose and piping right to the edge of a fire, these soldiers are protected by the Army's new aluminized kraft-paper fire fighting garb. Wearing the expendable suits over uniforms troopers were able to stand within two feet of flames for two to three minutes without discomfort although exposed parts of belinet liners were blistered. They made quick work of the fire.



No-hands phone. Here's a phone you can talk into without taking it off the hook. The box at right is a combination mike and speaker for use by shoppers with arms loaded Cincinnati is trying it.





Auto crates double cargo. In order to ship more cars in the same space, British makers have come up with the collapsible crate at left. Crated cars are loaded first, uncrated ones go on top.

24 POPULAR SCIENCE



New SeaMaster is tested. Several changes are seen on this latest version of Martin's XP6M-1 SeaMaster (PS, Nov. '57), shown here excepted by two speedboats as it takes off on its initial successful test flight Most straking are jet nacelles canted out to eliminate fuselage heating by the afterburner improved intakes and a changed tail fin. The Navy has ordered 24 of the mine laying seaplanes, which can drop an A-bomb

How to Boost Your Score on Any Test

You can't escape tests nowadays. But you can beat them. Here are the techniques that help you win jobs and promotions

By Darrell Huff

You can learn how to score high on tests. And you ought to if you want to get ahead. Because today testmanship, the art of achieving success in examinations, is a key to success.

Why? The psychologists have assumed the responsibility for assigning square pegs to square holes. Tests are their tools.

You have to do well on a test to get almost any decent job with government or big business, and, increasingly, with small businesses as well. A promotion often depends more on a test than on months of hard work—even high up the ladder. Says a General Electric personnel man: "Tests—we use 42 kinds—are given at all levels of employment."

That's not all, You take tests to get a license to drive a car, operate a radio transmitter or repair airplanes. And now the *Journal* of the American Medical Association proposes that retirement be determined not by age but by tests.

It's no wonder that the high school in my town—among many others—has increased the number and duration of its examinations. Not so much to assess the youngsters' learning, explains the principal, "but to give them experience in taking tests."

For test-taking is an art and can be learned like any other. Skilled in testmanship, you can make higher scores.

That goes equally for the two kinds of tests you'll face:

 Information tests, which try to find out how much you know.

Aptitude tests, which try to find out

how good you will be at something or other.

Get ready emotionally. You'll do better if you regard each test as a contest. The sporting, let's-see-who'll-win attitude—not grim determination or passive compliance—produces results.

The reason: Tests are battles of wits between you and the other fellow. Some-body wants information about you. You, on the other hand, have no interest in giving information. What you want to do is make the best possible case for yourself, just as you would during a job interview.

So tackle a test by first asking yourself what answer the tester wants—then giving it to him. Most people handicap themselves by trying to give "right" answers instead of wanted answers. These are usually the same, but not always. That's because no test is perfect, some are far from it, and many good ones are misused.

According to testimony before the Congressional committee on atomic energy, "Boss" Kettering of General Motors once gave the MIT entrance exam to 57 of his top engineers. Exactly 53 of them flunked.

Or take the case of the plant that needed people to assemble parts so tiny that they had to be held eight inches from the eyes. This obviously called for excellent eyesight. So the standard visual-acuity test, which checks vision at 20 feet, was used. Only after considerable damage had been done was it discovered that this test was turning away the qualified applicants and hiring the unqualified ones.





GAUGE YOUR POWERS OF OBSERVATION with this picture, used in testing would-be Federal operatives. Study it for five minutes, then try

to answer the questions on page 238. (The rules of testmanship will help, even if you're the type who barely notices his wife's new hat.)

The job, it turned out, was best done by nearsighted people—who flunk 20-foot tests but see exceptionally well at eight inches.

The vogue for intelligence tests has led companies to hire by IQ scores. One business found itself with the industry's brightest sales staff—and poorest sales.

So maintain a healthy doubt about how much sense the test makes. Combine this with a sporting, competitive attack and you'll be in emotional shape for a test.

Get ready mentally. If it's an information test, review if you have time. Cram if you don't.

Cramming is not the ideal way to learn anything and retain it. However, when you must learn something of minor importance and retain it just long enough to pull through an exam—then cramming can work wonders.

Review or cram actively. Use pencil and paper. Outline your material. Stop frequently to lean back, close your eyes and visualize. Underline each point in the book that you would use if you were constructing a test.

Actually, you can anticipate what will be used

It's simple. Study previous tests. Usually you can get whole exams or sample questions simply by asking. (For a set of "Specimen Questions from U. S. Civil Service Examinations"—some are shown on these pages—send 25¢ to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

Notes of likely test items can be fixed

inside your head even minutes before T-hour by super-cramming.

That's how a young man recently landed a semi-engineering job he would otherwise have missed. He knew he would come up against trigonometry problems. But he had never been able to memorize the formulas involved.

He wrote the formulas on a file card. For days he carried the card wherever he went, studying it on the bus, at breakfast, before going to bed. And he carried it right up to the door of the examination room and stood there running his eyes over it. Then he tore the card in two, dropped the pieces and went inside. Without glancing at the exam questions, he immediately wrote the formulas—before they could vanish from his fleeting memory—along the margin of the sheet. From then on he referred to them as he needed them. He placed second in a group of more than 100.

Preparing for an aptitude test. First brush aside all official advice. You will be told that these tests seek out inner aptitudes which studying and learning will not change. Supposedly, you can't study for them.

That's nonsense, and dangerous nonsense if a job is at stake.

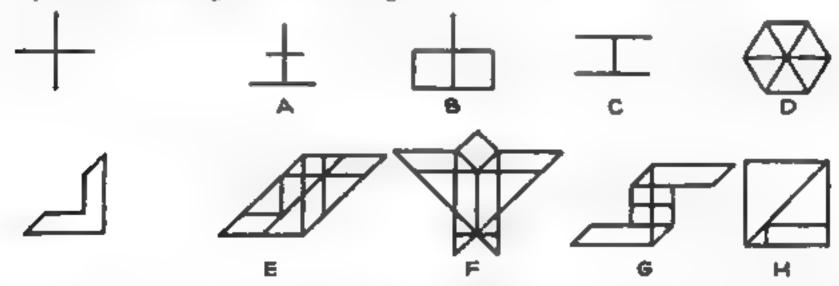
Truth is, the makers of the tests have not been able to eliminate the effects of learning, hard though they have tried. To the extent of their failure, you can boost your score by cramming.

But choose review material with care. It is effective to prepare for a test of

Quiz samples let you polish up your testmanship

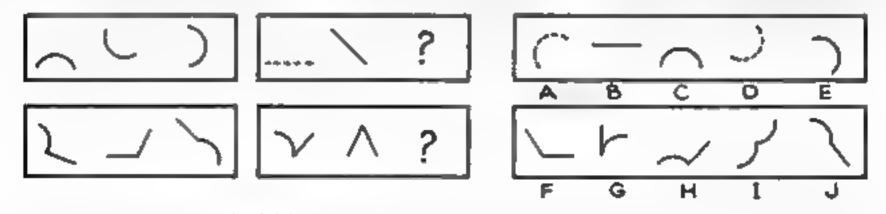
- 1. As a driver brought his truck into a long curve to the left at 40 m.p.h., he made a moderate application of his air brakes, and at that point he felt a pull to the right on the steering wheel. Which one of the following could not have caused that pull?
- A) sudden air loss in right front tire
- B) lack of super-elevation on curve
- C) lack of adequate tread on front tires
- D) unbalanced adjustment of brakes
- 2. In experiments on the localization of sound in space, the sounds which can be most accurately located by the hearer are those sounds originating at points
- A) in the plane equidistant from the two ears of the hearer
- B) in front of the hearer
- C) above and below the hearer
- D) to the hearer's left and right
- E) behind the hearer
- 3. Look at the rows of drawings below. In each row, the design at the left is contained in one or more of the more complex drawings. A drawing is to be marked as an answer if it contains the exact design in the same position. The designs in the drawings

need not be aligned with the original design, but they are not to be turned. The designs and drawings are two-dimensional. If more than one drawing contains the exact design in the correct position, mark more than one answer.



4. Each of the two groups below has two boxes at the left. The first box has three symbols, and the second box has two symbols with one missing symbol represented by a question mark. There is always some difference between the symbols in the first box

and the symbols in the second box. You are to decide what the difference between the symbols in the first box and the symbols in the second box is, and choose one of the symbols in the third box which can best take the place of the missing symbol in the second box.



5. There are five drawings lettered A, B, C, D and E. Four of the drawings are alike in

every way Find the one that differs from the rest.



mechanical aptitude by studying the laws of mechanics.

But for a language-aptitude test, don't waste time with French vocabulary or Italian idiom. Concentrate on principles of grammar and language structure.

For an aptitude test, unlike one on information, the basics of the subject are

more useful than the details.

IQ tests are the hardest to cram for. Increasing your vocabulary by learning many new words may help. But the most effective preparation is practice on intelligence tests. Even test-makers concede that you can lift your IQ five points by practice. So study. It will pay off.

What kind of answers will be expected of you—short or long? Aptitude tests are usually "objective," involving short, right or wrong answers. Information tests may be that kind, too, or they may require long written essays for answers. Again, you use different approaches to suit the

different types.

Consider long-answer exams. The most important rule: Make sure you're doing the right thing. Read all directions carefully. A lot of the people sitting around you will eliminate themselves just by overlooking or misreading instructions. And check that you have a complete, legible copy of the test.

Now apportion your time, but allow minutes for a read-through first and a review last. If you have an hour for 10 questions, allow five minutes for each.

Many examinations say something like "Answer five of the seven questions." Make your choices now, eliminating those you don't plan to answer before wasting

any time on them.

Then answer easy questions first. Use your time to get full credit for good answers to easy ones, instead of wasting time doing badly on hard ones. Psychologists have also found that you will do better on the hard questions if you save them for last. Your subconscious mind mulls them over while your conscious mind bats out answers to the easy ones.

If you do misjudge time, here are two

situation-savers:

1. Outline an answer. Notes indicating complete knowledge of the subject will garner far more credit than formal coverage of a single point.

2. Save words by using cross-references: "Efficiency of aircraft engines is

also reduced by factors mentioned in Answer 3 and first two paragraphs of Answer 4 above."

Simple writing devices upgrade your answers, especially—let's admit it—when you don't know as much as you might wish about the subject. Keep sentences and paragraphs short. Make diagrams, rough graphs, outlines of points. Underline important sections. Illustrate your points: "The main span of the Golden Gate Bridge, for example, is suspended..."

Use technical terms when you can. They save words—and time—and show your grasp of the subject. Properly used, they can hide your ignorance of some details. But beware, Improperly used, they give you away, dead.

Should you bluff? The poker rule ap-

plies: Don't bluff with nothing.

But don't give up unless you are sure that what you have is nothing. Asked to evaluate a point of view, you usually can restate it in several forms. Knowing only part of the answer, use what you know. The perfectionist, unwilling to do anything unless he can do it just right, often takes an undeserved beating.

Above all, play the prejudices of the examiner in such matters as humor, arguing, slang, handwriting tricks and over-used gambits. You can guess most of his prejudices. These rules will keep you out

of unnecessary trouble:

Avoid humor unless it comes naturally and easily.

 Don't argue with the questions, no matter how bad they are.

 Go easy with slang. It won't help and it may hurt.

 Be conservative about punctuation, spelling and grammar, even if the test has nothing to do with English composition.

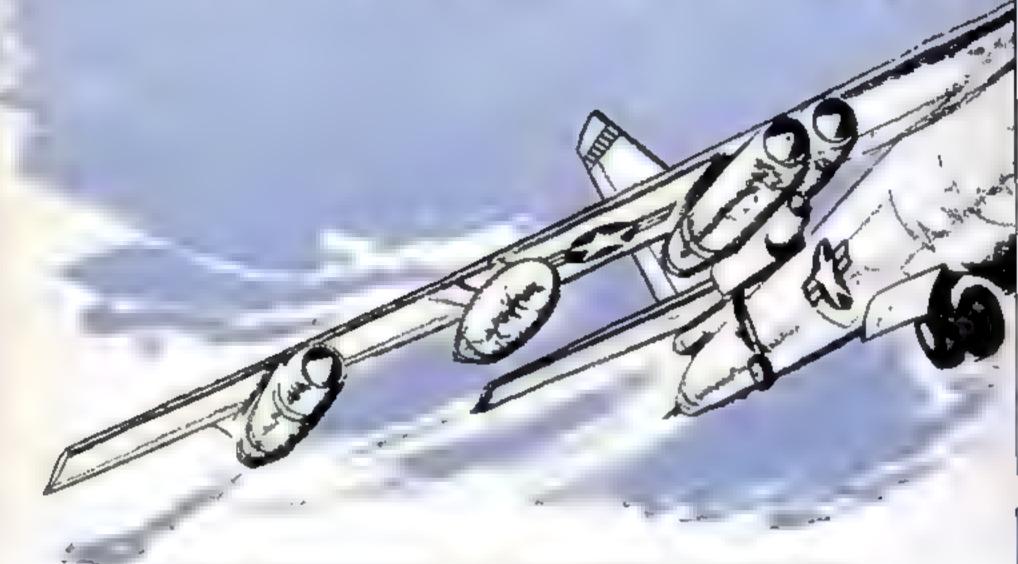
Write legibly and simply—no doo-

dling, no trick letters.

As for short-answer exams, these "objective" tests are the most widely used today because they are cheap and easy to give and to score. A single test organization administered 850,000 of them in one recent year.

Objective tests of both aptitude and knowledge are used to sift college students and scholarship applicants, Army and Navy personnel and officer candidates, job applicants, workers ripe for promotion, med students and surgeons.

The B-47 That Couldn't Come Down



The B-47 is at present one of our most important deterrents to aggression. Although classed as a medium bomber, it can deliver in a single drop more explosive power than was fired by all the armed forces during all of World War II. Each B-47 costs \$2,500,000.

So the professional pilots of the Strategic Air Command hate to lose one. Sometimes the men of SAC go beyond the call of duty to save one of their aircraft—especially a familiar one that has served them well on missions all over the world. This is the story of the long night in which a brave crew fought to save a B-47 from destruction.



THESE ARE THE MEN who shared a nerve-shattering experience on a "routine" flight. From left: Lt. Joe Fearno, copilot, Capt. Ed Wieland, bombardier; Capt. Bob Dupras, pilot.

30 POPULAR SCIENCE

By Eliot Tozer

AT 5:32 on the afternoon of Sept. 4, 1957, Capt. Robert W. Dupras swung his bulletlike B-47 into the landing pattern at Little Rock Air Force Base and reached for the lever that would lower his big bomber's forward main landing gear.

He was completing a routine local mission. There was no inkling of what was to happen; he was thinking that it would be good to get home to Edythe and the three kids at a reasonable hour for a change. With a practiced eye, Dupras checked the



Capt. Dupras hauled back on the yoke and the B-47 groaned and clawed for the dark sky. She gained 9,000 feet before he could level her off

green-glowing dials of his instruments. Each needle hovered in its proper place.

Capt. Robert Dupras, with 2,800 flying hours, 1,300 of them in the B-47, is a "lead" aircraft commander. That means he'll get one of the choicest targets if the Pentagon ever hits the button. After World War II service as a navigator he had returned home to civilian life in Glacier Park, Mont., but had come back to the Air Force in 1948.

About five feet behind Dupras sat Lt. Joe Fearno, copilot, a quiet-spoken red-head from Coolidge, Kan. Fearno moves slowly and says little. He's a good counterbalance to the lean, high-strung Bob Dupras. Like Dupras, he lives off the base except when the crew is on 72-hour alert, long periods of absence his young daughter Karen can never understand.

Deep in the nose of the B-47, cut off from the world except for three small windows and a tiny passageway back to Dupras' cockpit, sat Capt. Edward Wieland, bombardier. A notive of Minneapolis, Ed Wieland is short, stocky and fast. If there's anything to laugh at in any situation, Ed Wieland spots it first.

Bob Dupras was halfway through his landing checklist when he saw trouble, quiet but chilling. His forward main landing gear had not dropped into place. He snapped down the landing-gear lever again. Nothing happened. A quiver of

tension stiffened him, and he hit his mike button. "We've got some trouble up here," he said to the tower. "Request permission to leave the landing pattern."

He poured the coal to his Stratojet's six powerful J-47 engines and climbed out to 16,000 feet, where a jet bomber in trouble belongs.

of main landing gear, forward and aft, and two smaller outboard wheels. Normally, the pilot lowers the gear with the electrical system. In an emergency, he can force it down with the ELGE (Emergency Landing Gear Extension), a hand-operated mechanical system.

Dupras called Fearno. "Joe, get down on that ELGE handle, will you? Forward main is jammed in the UP position. And make it fast. We're running pretty low on fuel."

Joe Fearno scrambled down off his high perch behind Dupras and wedged himself into the crawlway to the left of his seat. He heaved on the ELGE handle again and again. It would not budge. He crawled back to his seat, breathing hard. He had fought with the handle without oxygen. "No go," he said.

Dupras studied his fuel-flow meters, then radioed to Bow Legs Control at Little Rock.

"We can't get our landing gear down," he said tightly, "and I'm running out of fuel."

Minutes later, Bow Legs called back, "We've got a tanker for you, Five Nine, from Barksdale, Rendezvous over Texarkana at 6.50 p.m."



Bob Dupras wheeled his big bomber onto the specified heading of 360 degrees over Texarkana and flicked on his electronic rendezvous gear. He was hungry and tired. He drummed the top of the steering yoke as he waited for the rendezvous gear to warm up. Its radar would help him find the

Dupras brushed the jettison button and the world exploded

tanker in the growing darkness. Then he saw with despair that the rendezvous gear

wasn't working.

He scanned the sky tensely. He had less than 30 minutes of fuel remaining just enough to make one pass at Barksdale AFB at Shreveport, and if that

failed, pull up and bail out.

Then he found it, a KC-97 from the 376th Air Refueling Squadron at Barksdale. The tanker had just helped support a big mission from Second Air Force, so it had little spare fuel aboard. But it had set a record in getting airborne in 18 minutes after the call for help from Little Rock. Normally it takes two hours to preflight and launch a tanker.

When Capt. Dupras finally broke away from the KC-97, the sun was well down behind the Ouachita Mountains and Little Rock AFB was wrapped in shadow. His fuel problem, though not solved, was put for the moment in the background of

Dupras' mind.



7:40 PM voice from Bow Legs Control. Lt. Col. Arthur W. Kenyon, ranking officer of the 544th's Standardization Board, had climbed into the tower. So, too, had three other ranking officers, one a general. With the four regular tower operators standing by, Col. Kenyon took over.

"Five Nine, the Boeing people at Wichita called seven of their engineers back to the factory to sit in on a round-robin telephone hookup with us. They may have some ideas that'll help. Can you stand by until we get it set up?"

Dupras, tooling his B-47 in wide circles around the familiar lights of Little Rock Air Force Base, replied, "I've only got about one hour of fuel, Colonel,"

"Okay, Five Nine, we'll set up another

tanker to rendezvous with you at 8:30."

Another tanker, thought Dupras. Another hookup without rendezvous gear, this one in total darkness. "Roger," he said wearily.

Bob Dubras knew that fighter pilots sometimes snap down jammed landing gear by nosing over into a dive and pulling up sharply. The centrifugal force at the bottom of the pull-out jerks the gear down. The B-47 is no fighter. It's a clean-lined heavyweight that builds up speed quickly. Fully loaded, it grosses 200,000 pounds. If its wings are subjected to forces much greater than three Gs, they can buckle or snap off.

Dupras pressed his mike button. "I'm going to try a pull-up," he said. "I'll try to hold it down to two Gs." He paused. "If we get into trouble, you blow the canopy, Joe, and go first. I'll bail out

right behind you."

"Roger," said Fearno.
"Are you ready, Ed?"

"We're always ready down here," cracked Wieland.

Gently, Bob Dupras nosed the B-47 downward, his eyes riveted to the air-speed indicator, 350 knots... 375... 400... Now! He hauled back on the yoke and the B-47 groaned and clawed for the dark sky. She gained 9,000 feet before Dupras could level her off.

But the landing-gear position indicator

did not move.

With the Boeing engineers calling the signals by telephone and radio, Dupras had tried a dozen fixes—with no luck. As he swung southwest to rendezvous with his third tanker, he felt that time was running out. Even the engineers seemed to be grasping at straws.

Carefully Joe Fearno chopped a hole in the aft bulkhead so he could watch the landing-gear cables while Ed Wieland beaved on the ELGE handle. He made each stroke with deliberate caution so he would not slash an electrical cable or a hydraulic line. Then, while Wieland hauled on the handle, Fearno watched the wheels. They

... The cockpit filled with dust as the B-47 pitched forward

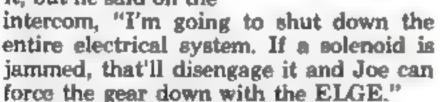
trembled in place but they did not go down.

On the way back to his station, Wieland straightened up beside Dupras. "Joe's out of cigarettes," he said. "And we're almost out of drinking water." They both smiled.

Wieland rubbed his belly ruefully. "Man, I'm hungry," he said. "When are you going to land this thing, Bob?"

5:30 AM

Wearily Dupras thought back over the nightmare of the past 14 hours. He had tried everything but the most drastic fix of all, He still didn't feel easy about it, but he said on the



Fearno and Wieland stiffened in their seats. With electricity off, the B-47 would lose all her lights, radios, fuel-flow meters, rudder and elevator boost, and gyro instruments. She would be a dark, blind, almost helpless airplane.

"What if the power doesn't come back on?" asked Fearno.

"I'll fly it around until daylight, then I'll try to take her down."

Fearno whistled quietly.

"If you want to," said Dupras, "you can bail out before we go down. I'll have to jettison the canopy anyway so we can get out in a hurry, if we land in one piece."

Buried deep in his radar-studded compartment, Ed Wieland uncomfortably considered the dangers of bailing out. Ejection seats sometimes fly erratically, and parachutes sometimes do not open.

In his tiny cockpit, Joe Fearno reflected on the difficulties of landing a giant bomber without wheels or brakes. Unless Bob Dupras greased his B-47 onto the concrete, the impact might slam all three of them into their instrument panels. A slight crosswind could send the airplane skittering along sideways; if a wing dug in, they might go cartwheeling down

the runway. And even if Dupras did a masterful job, the heat of friction as they skidded would probably ignite the aluminum belly, possibly starting a fire that could cremate them.

But Joe Fearno also did not want to abandon his airplane. "I'd rather stay," he said quietly.

"Ed?"

"I'm with you," said Wieland.

"Okay," said Dupras. "For the last couple hours, Boeing has been working out a special procedure for shutting down the electrical system. If it doesn't work, we'll take her on down."

The sun came up red as Dupras broke away from his fifth tanker. He headed north, listening carefully to Boeing's shut-down instructions. There were nine complicated steps to be followed. He repeated each one aloud as he wrote it on the pad of his knee-board.

"Now, in case the power does not come back on," intoned Bow Legs, "you're instructed to use runway Zero Six. You'll have a five-knot crosswind about 20 degrees from the left. We've already got a crew putting down foam. That'll help you slide and will reduce the chances of fire."

"Put some vehicles where the foam starts, will you?" asked Dupras.

"Wilco, There'll be trucks on both sides of the runway. Where are you now?"

"I'm at 13,500 and I'm going up to 16,000 before I turn the power off. If you don't hear from me in 15 minutes, you'll know it's out for good."

"Okay, and Bob, we're betting it will come back on."

In the tower, eight haggard men waited for word, For the first time in 11 hours they could see the crippled B-47. But there was no sound from her radio.

Then it came. "Bow Legs Control—"
A united sigh of relief went up in the tower.

The voice in the B-47 continued: "I'm sorry. It didn't work."

"Bob, both Boeing and Second Air Force Headquarters agree there's nothing else you can try. Why don't you guys take a last cigarette, then we'll wrap this

thing up once and for all."

"Okay, Bow Legs Control. Let's get the show on the road. We just ran out of oxygen!"



Now the heat was really on. Dupras had flown to the Camp Robinson drop area to jettison the canopy. At 8,000 feet, he put the plane on autopilot and turned to look back at Joe Fearno. Except for the final landing, this was the most dangerous part. If the canopy slammed down as it tore loose, it could slice the heads off Dupras and Fearno.

"Ready?" he said.

Joe nodded, and they both hunched forward.

Dupras brushed the jettison button, and the world exploded. The cockpit filled with dust, The B-47 pitched forward. Quickly, Dupras straightened up to grab the controls and the gigantic hand of the slipstream smashed his head back. Its fingers ripped at his oxygen mask But he was jubilant: The canopy had

broken away cleanly.

As he headed back toward Little Rock, Bow Legs Control droned in his ears almost constantly. The tower did not want to infringe on the authority of Dupras as aircraft commander, but they knew that after 16 hours of constant tension, Dupras must have lost the fine edge of flying skill; he needed all the help he could get. "Be sure to stow all loose gear," said Bow Legs.

"Roger," said Dupras. "I've put the files and the sextants under my feet."

"Boeing warns you that with the canopy off, she'll buffet very severely as you approach your best flare speed. She'll be hard to control all the way down."

But control was the least of Dupras' problems now. When the canopy tore loose, it had pulled all three pins on his ejection seat. The seat was now cocked to go off. If Dupras accidentally raised the armrest as much as an inch, he would

be blown out into the sky. Slowly, carefully, he reached up over his shoulder to replace the pins. He inched his arm out into the slipstream, fighting to keep the blast from ripping it out of his shoulder. Minutes later, one pin was in place. One would have to do, he thought wearily.

"Five Nine, better tell Ed to break the safety wire on his hatch so he can blow it as soon as you come to a stop, and . . ."

Dupras cut him off, "Stand by, Control! Engine No. 6 is running rough."

Almost in a daze, he watched his fuelflow meter. The needle fluctuated wildly. Then it dropped to zero. The airplane yawed sharply to the right as the engine slowed. Dupras retrimmed the plane and studied the meter. "No. 6 is dead," he said.



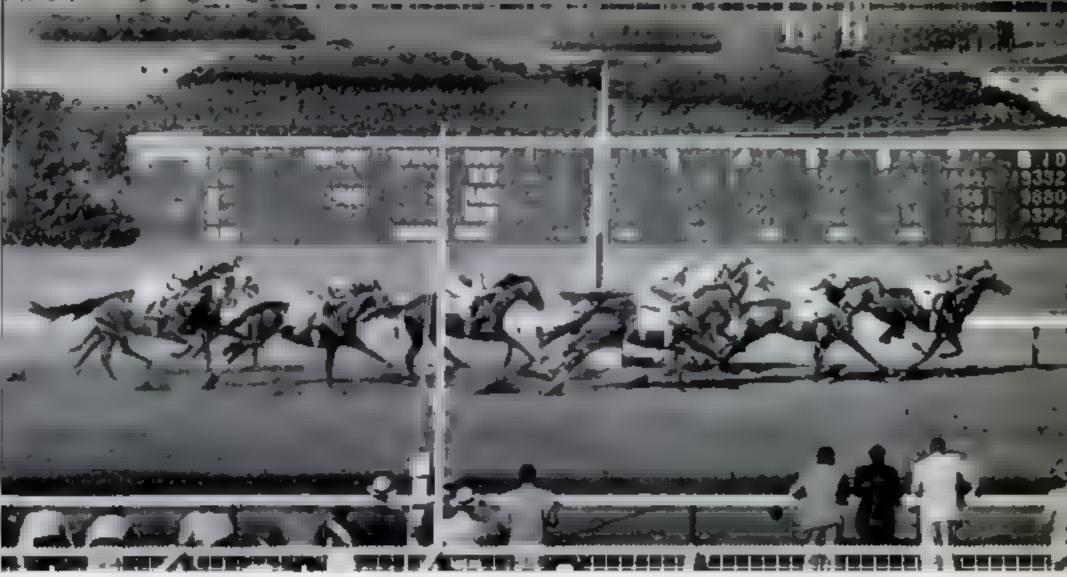
Nine fire trucks, three ambulances and a dozen staff cars waited beside runway Zero Six as the B-47 wheeled onto her downwind leg. Five thousand gallons of foam glistened in a wet streak down the center of the runway. The field was closed to all traffic. In the tower, a colonel described every action over a hot-line phone to Second Air Force Headquarters. In Wichita, a haggard group of Boeing engineers waited. Now it was up to Bob Dupras alone.

At a carefully controlled 151 knots, he nursed his bucking B-47 downwind, then out toward the southwest to bleed off altitude. Over and over again, he went over the final steps of the emergency landing:

1) Pull all fire shut-off switches; 2) lock shoulder harness; 3) hit the alarm bell to warn Joe and Ed that they'd reached the payoff.

He had gone over his weight-and-balance figures 20 times in the last hour. He knew he'd be down to a bare 6,000 pounds of fuel when he flared out, that his weight

[Continued on page 240]



Like a giant eash register, the tote board posts its sales. Above, at Hollywood Park, Cal,

The Amazing "Tote":

Billion-Dollar Betting Machine

AST year, more than 51,000,000 Americans paid to watch horses race, and bet the bewildering sum of \$2,799,000,000 on the outcome. For the fifth year in a row, the so-called sport of kings led all others in popular appeal. For the eighth year in a row, the amount wagered

on the horses set a new national record,

"Playing the horses" would never have become the favorite game of millions if it had not been for two players—a Frenchman and an American—who lived a couple of generations apart.

The first was Pierre Oller, a Parisian

TICKET MACHINE (shown with its top off) prints tote tickets, registers on an inserted paper form the total amount bet on each horse in the race, and on all the horses together.

BACKSTAGE WITH THE TOTE: Member of operating crew holds a light box with 24 bulbs. Each of these boxes—there are 287 on the main board—can display any digit from 0 through 9.



Crossed wires are costly . . . On May 15, 1956, a tote overpaid

businessman, who invented pari-mutuel betting. Offer loved to bet on horse races, but he became fed up with having to place his bets with a bookmaker and accept whatever odds the bookie might choose to offer him.

"Why not bet among ourselves?" he asked a few fellow racing fans, along about 1865. (Mutual betting is what the French term pari mutuel means.)

Here is what Oller had in mind: If he knew how much money had been bet on all the horses in a race, and what proportion of the total sum had been wagered

on each horse to win, he could easily calculate odds that would accurately reflect the mass judgment of the bettors. The more of them there were who bet on a particular horse, the lower the odds on that mag would be. What could be fairer to gamblers than that?

At the birth of pari-mutuel betting, Oller himself held the stakes, calculated the odds and made the payoffs. Those who had bet on a horse that won a race

divided the money that had been bet on all the other horses in the race, in shares commensurate with the size of their wagers.

That is still the essence of pari-mutuel betting, though it has grown complex with age. Because of its indisputable fairness, it rapidly became popular. Very soon, individuals no longer could hold the stakes and make the calculations. First clubs and then racetrack managements took over the burden, hiring betting-ticket sellers and accountants by the hundreds. As the crowds of bettors increased, even this army of calculators couldn't make an up-to-the-minute accounting of the flood of cash or the way it was bet. The estimating of odds at tracks lagged farther and farther behind the actual betting.

That irritating situation led Henry L. Straus, a young Johns Hopkins math professor, to invent the marvelous totalizator—or "tote," as the nation's horse followers and racing writers call it—that now keeps instant track of all the bets at nearly every race course in the U. S. Without the tote, a kind of giant electric cash register, pari-mutuel betting on its present scale would be impossible.

One day in 1927, at Havre de Grace, Straus got particularly annoyed when he was paid off on a winning ticket at odds far lower than the last he had seen posted.

He wasn't being gypped. The final, correct odds simply hadn't been calculated until he stood in front of the cashier's window.

He left the track, furning, with the idea that he could devise a way to register horse-betting automatically.

The method he devised—with the help of A. J. Johnston, a General Electric expert on telephone circuitry—is now in operation at most of the nation's tracks. It made its debut at

Arlington Park, Ill., in 1933.

Here are the principal parts of a Straus tote:

 Ticket machines, of which there may be as many as 411 (at Santa Anita).

A collector and dispatcher of electrical signals from the ticket machines—a sort of robot traffic cop.

 39 adding machines, which register the signals coming to them through the collector, and which look nothing like ordinary adding machines.

An electronic odds calculator.

• A display board, which normally stands in the infield of a racetrack, facing the crowd. The largest board is 180 feet wide and 12 feet high. Some tracks have two of these. Each accommodates miles of wiring, thousands of electric lights and a high, narrow room for a crew of men

The Day Beer Stopped the Betting

One grim afternoon at a Southern California track, a few minutes before the day's betting was to open, a tote manager discovered that one whole section of the collector was dead. In a frantic search for the trouble, he found that beer from a bar on the level above had sceped through the floor, dripped into that portion of the collector and shorted every jackplug in it. The afternoon's racing was inexorably delayed a full half-hour, while impatient fans fumed at the ticket windows and fretful track officials hectored the tote-room crew, until mery jackplug in the crippled area had been cleaned out with carbon tetrachioride.

Daily Double winners \$77,000

ready at any instant to deal with a faulty wire or replace a dead bulb.

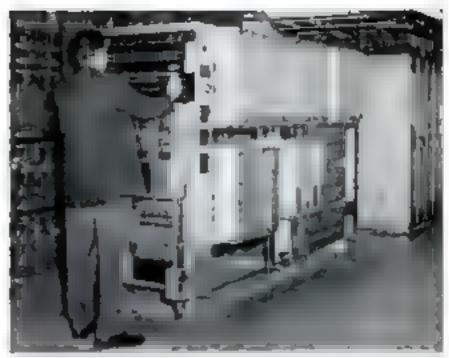
Each of the tote's ticket machines prints and sells tickets for only one size of bet—out of seven that are possible at most tracks. It can turn out about 50 tickets a minute. But the tote's massed adding machines can record bets from 21 ticket machines at a time, in 30 thousandths of a second. They keep a constant record of how much money has been wagered and how the bets have been placed. Every 90 seconds during the period before a race starts, the tote automatically flashes the latest results of this furious accounting across the face of the infield board. At the same time, it posts there in lights the up-to-the-minute, approximate odds on each horse to win the race estimated by the calculator.

As the race starts, an official presses a button that locks every ticket machine at the track and instantly halts the betting. The lighted record of bets and odds remains frozen on the tote board during the race. Within a few seconds after the finish, the board displays the winner's number and time, the numbers of the horses that came in second and third, and the payoffs on those three horses.

The payoffs shown in lights on the tote board are always figured for the two-dollar bettor, who makes up most of the betting population at any track. And they are calculated by men, not machines, though the men use the tote's odds.

The Straus tote, which is built and owned by the American Totalisator Co., is really first cousin to a dial-telephone system. They both use the same kinds of relays and rotary switches. In the telephone system, the rotary switches put calls through. In the tote, they turn on lights and display on the tote board the latest messages from adding machines and odds-computer. The tote's collector. which gathers incoming signals from all the ticket machines at a racetrack, works like the telephone system's line-finder. It completes a circuit to the proper adding machine for each ticket issuer as the electrical impulses pile in, and, in effect, gives a busy signal to the others until their turns come.

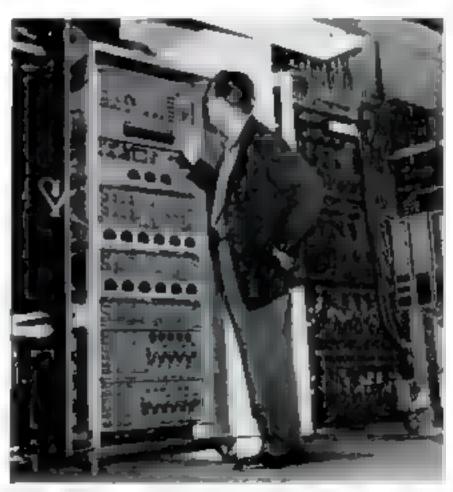
The Straus tote has two marks of distinction: It is portable, and it isn't for



THE COLLECTOR: This complex electronic instrument closes a circuit just long enough (30 thousandths of a second) to record a single bet.



THE POOL ADDING MACHINES: The one at far left totals "win" bets, the center unit "place" bets, the one at right "show" bets.



THE AUTOMATIC ODDS COMPUTER: Every 90 seconds this calculator takes the latest totals from all the adding machines, figures out new odds.



CLOSED-CIRCUIT TV SYSTEM lets men in tote room, down under the stands, keep a constant watch on the board. Cameras are controlled from the switchboard at the man's left hand.

sale. Though the tote at full tilt utilizes about 300 miles of wiring and weighs around 150,000 pounds, two dozen men can take it spart and have it on its way to another track in six hours. Most of the wiring stays put. The mechanism is largely compartmented, and its units can be hung on hooks in steel frames at any track and plugged in.

Straus totes, like many costly business machines, are rented, not sold. The company collects a tiny fraction of the tote's "handle" as rent, and in return provides the tote and a crew to keep it working.

Most of the tote's parts are out of public sight and reach, and always under the eye of some vigilant crew member. So malicious mischief is a very unlikely threat. But a part may abruptly break. Wiring can suddenly become faulty—and crossed wires in a tote can be terribly costly. This happened (but not to a Straus tote) at Bay Meadows, near San Francisco, on May 15, 1956. As a result, holders of winning Daily Double tickets were overpaid \$77,000.

American Totalisator crews never take it for granted that because a tote worked fine yesterday, it will today. Always, before a day's races start, the whole, sprawling, intricate system is given a workout.

First, all the betting circuits and all the lights are tried out. Then comes the "crash" test: The No. 1 button on every ticket machine on the grounds is pressed down and attempts, as a master switch is thrown, to register its test bet. This is the supreme trial for the collector, its greatest possible overload. Ordinarily it undergoes this unlikely ordeal calmly, handling 21 bets at a time without a sign of palpitation. But the testers daily make sure.

The fabulous tote goes about its intricate day's work with very little fusa. Even on such a stupendous day as May 5, 1956, at Churchill Downs, Ky., when it accounted for \$4,360,232 worth of gambling, the tote is largely silent. Only a subdued chatter of relays reveals that it is

doing anything at all.

Arrayed in steel cabinets, behind locked glass doors, the parts of the tote that lie below stands look rugged and dependable. Mostly, they are. Parts and wiring seldom act up. In case of main-line power failure, which happens occasionally, a standby bank of 39 four-volt storage batteries instantly takes over. The batteries run everything but the tote-board lights. At some tracks, a gasoline-powered generator is stored inside the tote board for just such an emergency.

Pari-mutuel betting garnered \$207,-000,000 in tax revenue last year for the 25 states where it is legal, Tax collectors in those states love the totalizator, and so do the track owners. Its unassailable honesty encourages lots of people to bet, thus increasing the take for both state and track. Both are sure of getting their money, and promptly. Whenever the tote computes odds, it first automatically deducts the state's and track's combined share (ranging from 10 to 16 percent) from the sums bet on all the horses, and bases its odds on the net totals. Thus they never can lose a cent, no matter how heavy the payoff is.

Even bookmakers, wherever they still manage to elude the police, are fond of the tote. That's because they pay off according to the published tote odds, and since they personally are not burdened by the necessity of contributing a percentage to state and track, that is always a hidden asset.

Harry Straus's tote eventually made him a millionaire and enabled him to become a noted breeder of horses and cattle. Tragically, he died in his early fifties. He and Johnston—the man who helped him create his remarkable betting machine—were killed over Maryland on Oct. 25, 1949, when a private plane exploded in midair.—Wesley S. Griswold.

New Ideas from the Inventors

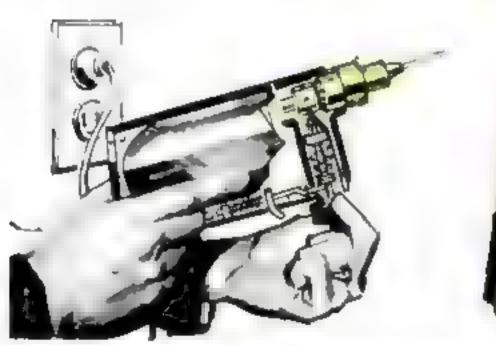


1 Tablecloth Sets Itself. A plastic table cover with built-in dishes might simplify picnic packing, table setting, and clean-up. In one form of this recent pat-

ent, plates would be bonded to the cloth; in another version, they'd be removable—attached by means of metal or plastic forms and retaining rings.

2 Built-in Key Works Chuck Jaws. Changing drills and attachments might be simpler if your chuck had this unlosable, no-fumble key. To engage it, you'd merely press it forward against a spring. A switch would keep the drill from starting until the key was disengaged.

3 Pump-Up Umbrella Fits Pocket. With this compact cylinder stowed away, you'd be all set to outwit sudden squalls. Part of the telescoping, pocket-sized tube would serve as both pump and handle, the other part would provide storage space for an inflatable plastic rain shield.





Please turn the page for more new ideas





4 Cup Cools Your Drink. To chill a beverage in a hurry, you'd pour it into this steinlike cup and puncture a carbon-dioxide cartridge by turning a thumb-screw. Gas escaping—and expanding—through a coiled tube between the inner and outer walls would act as a refrigerant.

5 Tablet Times Sprinkler. You'd know when your lawn was properly watered if you had this depth gauge and signal on the job. Until moisture reached it, a water-soluble pill placed in the ground stake would block a spring-loaded plunger. Then the pin would drop and raise a flag.

6 Driveway Gate Pushes Open. Even in good weather the routine of opening and closing a gate is one most drivers would gladly skip. Bumper pressure

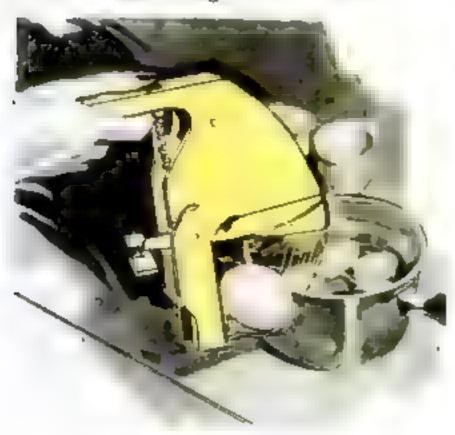
against a cam on this gate would unlatch and swing it open either way. It would also lift a set of hinge rollers. These, reseated by gravity, would shut the gate.





7 Carrier Locks to Golf Clubs. A golfer who likes to travel light could slip one or more clubs into these paired padlocks and take off for the green. Left on while the clubs were checked or in transit, the lock-handle would keep them together and prevent unauthorized use.

Begs Lifter Stices Shells, Too. Tenderskinned diners who burn their fingers on soft-boiled eggs may get help from this device. It is designed to lift the hot spheres from boiling water, then simplify opening them by slicing part way through the shells. A wire loop at the base would cradle the egg; squeezing a trigger in the handle would bring down a blade.





Guides Shoppers. An indexing system like this might make it easier for occasional shoppers to find their way through a supermarket maze. Pushing a button next to the name of an item listed on a directory would flash a light on a keyed map of the store, or over the appropriate counter, or at both.

The following patents have been usuard on these inventions:

1 Patent No. 2,792,007 to G. S. Pudial, Caravas, Feneracia, 2.
No. 2,807,732 to Joseph Kurtovich, Dutath, Minn., 3. No.
2,810,391 to John Paul Jones, Jr., Pottstown Pa., 4. No.
2,805,556 to Fensan Fang, Tokyo, 5. No. 2,740,371 to Gorman R. Nelson, Stoux Fails, 5. D., 6. No. 2,742,722 to Harry P.
Schaeler, Cisco, Tex.; 7. No. 2,738,113 to Marshall D. Sigler,
Richmond Va., 8. No. 2,795,252 to Earth. Morne, Pomeroy,
Pa., 9. No. 2,808,579 to Francis I. McCarthy San Francisco.
Copies of patents may be ordered, by number, from the
Commissioner of Patents, Washington 25. D. C., at 35 cents
each To write to an inventor, of the address given above is
insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents

Layer-cake look vanishes with these tricks for:

Hiding Plywood Edges

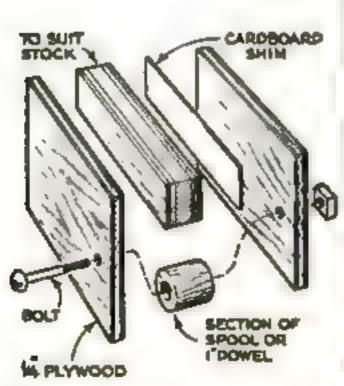
AYBE you don't mind seeing end grain or corewood in your natural-finish plywood projects. If so, fine, But if you feel that hardwoodveneered plywood, or fir plywood with a grain-taming finish, deserves a solid-wood look all the way around, you can have it in a variety of eye-filling and craftsmanlike ways.

First on the list is commercial edging tape, which comes in handy 8' rolls and is now available in practically every wood grain used for veneering plywood faces. Some of these tapes have self-adhesive backing. Others must be glued in place—preferably with contact cement. Both are so thin that their edges can hardly be seen. That's good for the solid-wood illusion. It also makes these tapes the right choice for banding curved or circular edges. One caution, though: Because

commercial tapes are so thin, the panel edges and joints you apply them to must be absolutely flat. Otherwise it's impossible to align them perfectly, and telltale rippling will show through.

If you're very fussy, you may object to a slight difference between face veneering and edging tape. This can't be helped because no two pieces of wood are exactly alike, and the same goes for veneers. If this troubles you, your best bet is to cut your own tape, using strips removed from the parent panels. These can be made wager-thin with power sanding.

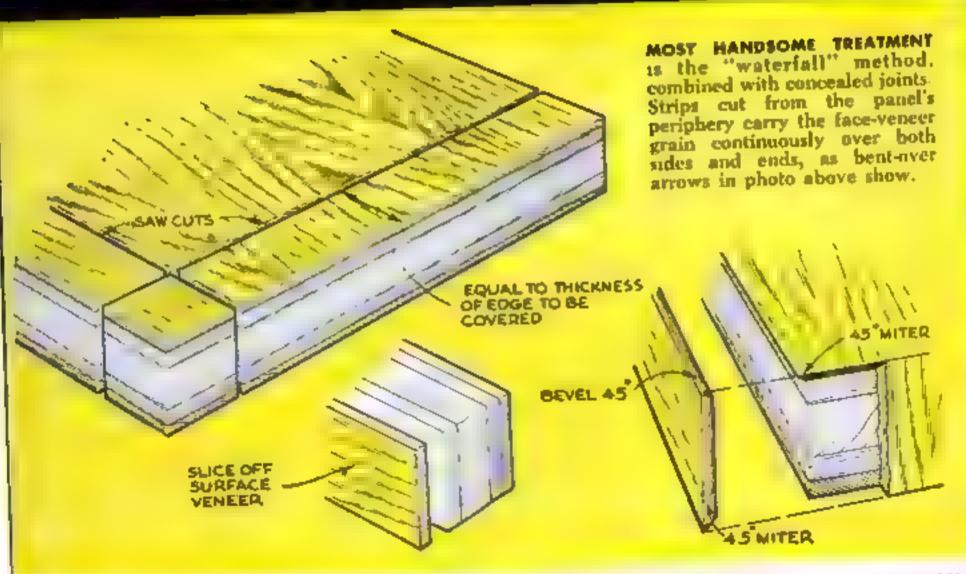
Want something even finer? Then try your hand at making invisible edge and end joints. As the photos on this and the following four pages show, the table-saw setups are simple, and the results well worth the little time it takes to produce the best of plywood edges.



EASILY MADE GUIDE and roller speed the job of aligning and applying edging tape. Leave circular work on the lathe while you reel the veneer strip into place.







Simple tape tips you should know



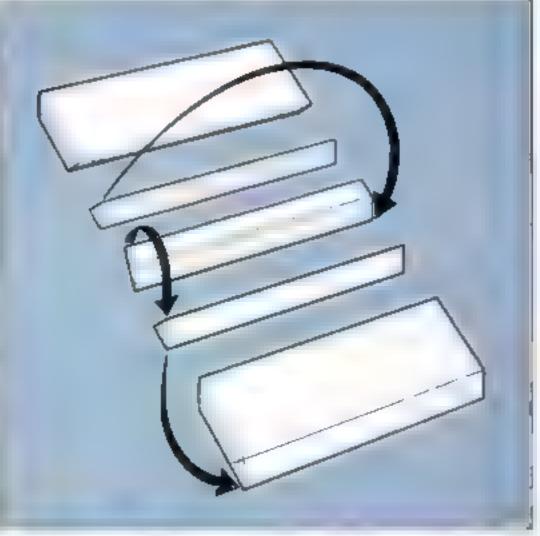
HOLDING THE PAPER-THIN TAPE while you apply solvent to the back of the self-adhesive type, or contact cement to the chicless kind, can be done effectively with a spring paper clip nailed to your bench top. Tension the ribbon of vencer between the clip and your free hand.

CARE IN ALIGNING TAPE when you press it into place—and beforehand, in leveling the surfaces to be covered—are both extremely important to the success of an edge vencering job. Here, homemade tape—cut from strips of the work stock, insures a perfect color match.

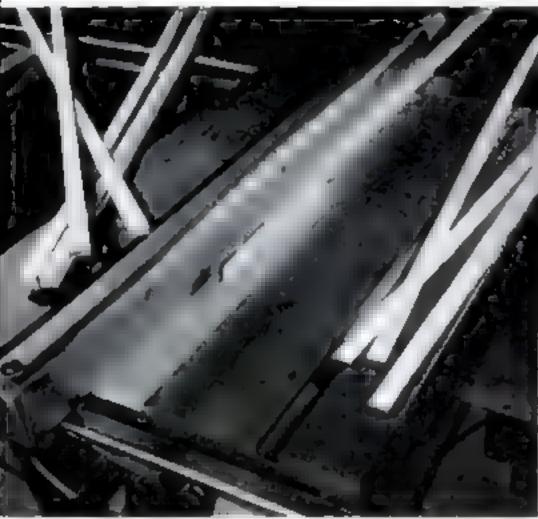
These edges hide their glue joints.....

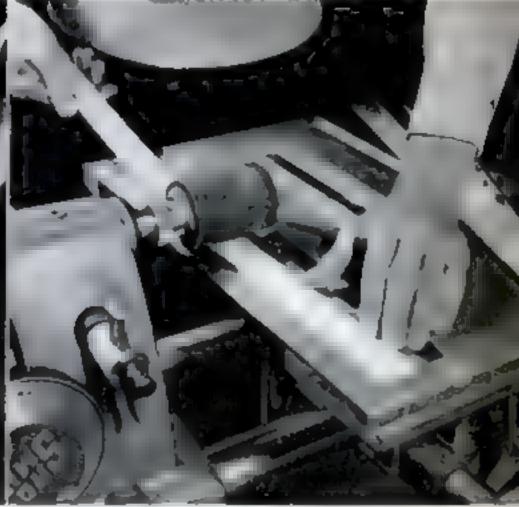


MITER EDGING gives table and counter tops that solid-wood look with just one pass through the saw for each edge. Make a 45-degree cut that does not reduce the thickness of the cutoff.



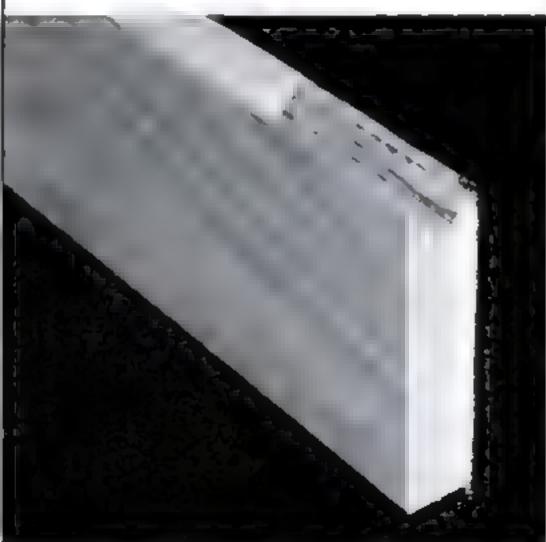
Turn the cutoff end-over-end, give it a quarter turn on its axis, and glue it back on the parent stock. This way, the veneered undersurface becomes the new exposed edge.





TAPING STRIPS, custom-tailored on your saw, won't be drawn down into the table slot if you make a hardwood fuset and let the blade cut its own clearway. Run off the strips of tape slightly wider than the edges to be covered, and sand down the overhangs after cementing.

power sanding lets you reduce veneer strips to water thinness. With a multiple-purpose shop tool, a drum sander does the trick. As an alternate, you can use a disk sander chucked in a drill press. Lither way, always feed strips against the rotary action of the sander.

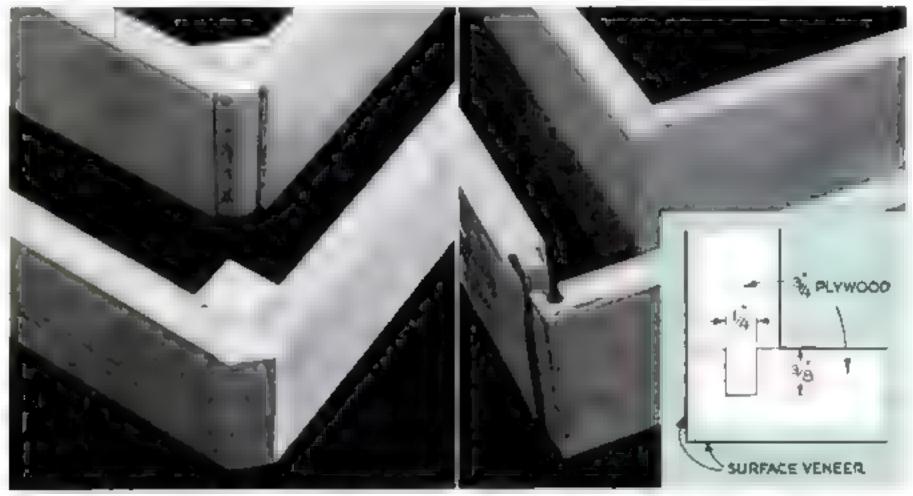


V-SHAPED EDGING is a natural for hinged cabinet doors and small panels which will be viewed from both sides. Here, triangular-shaped strips are glued into matching grooves. Set up the



saw so the outer sides of the 45-degree kerfs just touch the plywhold edges. This method is not recommended for large panels, which are too difficult to guide through the blade.

3 ways to hide layer-cake edges on corners



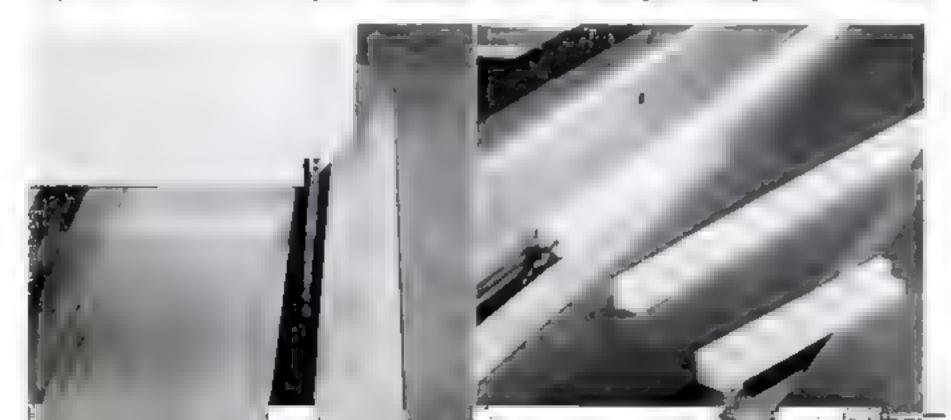
SOLID-WOOD INSETS, used with glue-block backing, produce corners that are both distinctive and strong. The insets may be square or triangular, round or cove. Recessed or raised insets will heighten the decorative effect.

of the surface veneer exposed. It's a simple and trim way to finish a corner, but one that produces little structural strength. For a beefed-up job, add a tongue and groove.



DELUXE, LOCKED-MITTER CORNER, shown above, uses an L-shaped spline for accurate alignment and maximum strength. A dado head is useful but not necessary for cutting the ¼"-wide grooves that take the splines. If you use a regular blade, run off ¼"-deep kerfs to form the outer edges of each groove. In photo below, at left, note that the inner kerf just touches the

bottom edge of the miter cut. Remove waste stock between the ker's with additional passes of the saw. Make the splines from ½"-square hardwood strips. Adjust the table and rip fence for undercuts that will form an L-shaped cross-section by clearing out a ¼"-square rabbet. After applying glue, align the mitered edges and drive the splines into place.



The POPULAR SCIENCE Shop Notebook

Sanding-drum sleeves can be improvised in a jiffy from strips of garnet paper, cut three from a standard sheet. Coat the drum with rubber cement and wrap a strip around it with the lap pointing opposite to the direction of rotation. A few turns of twine will tie it in place. Peeling the paper and reapplying it upside down gives a fresh abrasive surface. Almost as effective as a regular sanding sleeve. this makeshift method is cheaper and offers a simple quick-change of grits.—Edwin Love, Palmdale, Cal.



Jack does the work in lifting a drill-press table The "jack" in this case is the auto-bumper type. It is slow, but enables you to raise the table into position without struggle. Keep the jack close to the column, though, as a precaution to avoid cracking the table casting.—Rudolph Tomek, Tappan, N. Y.

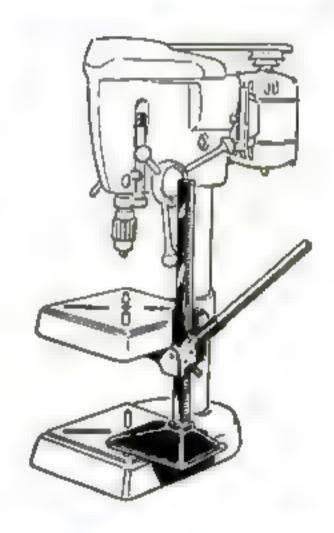
Plastic electrician's tape does a better job when it is warm, especially in cold weather. After cutting off a strip, heat it by holding against a light bulb. You will find that the warmth not only makes the tape stickier, but gives it more stretch, which makes it possible to do a more efficient wrap-around job.—Dave Johnson, Wesleyville, Pa.

Coffee-can keys can do duty as custom-made drivers for tiny screws. It takes only a little grinding or filing to make them fit into the smallest screw slots.—

James T. Aylward, San Jose, Cal.

Rolling straightens out a short length of copper wire or tubing. First unkink the piece the best you can with a pair of pliers or your fingers. Then place it on a flat, solid surface, such as a drill-press table, and use a heavy block of metal as a rolling pin.—
Richard Kent, Sherborn, Mass.

Fingers cut from an old woolen glove and slipped over the jaws of pliers are handy for protecting polished or soft metal surfaces. This way is quicker than wrapping cloth, leather or rubber around the piece you are getting ready to put pressure on.— William Swallow, Brooklyn, N. Y.





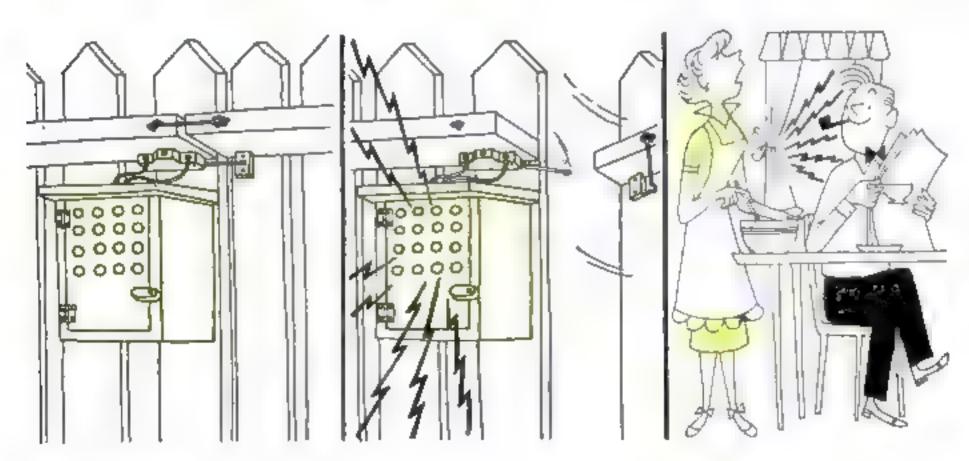
MAY 1958 47

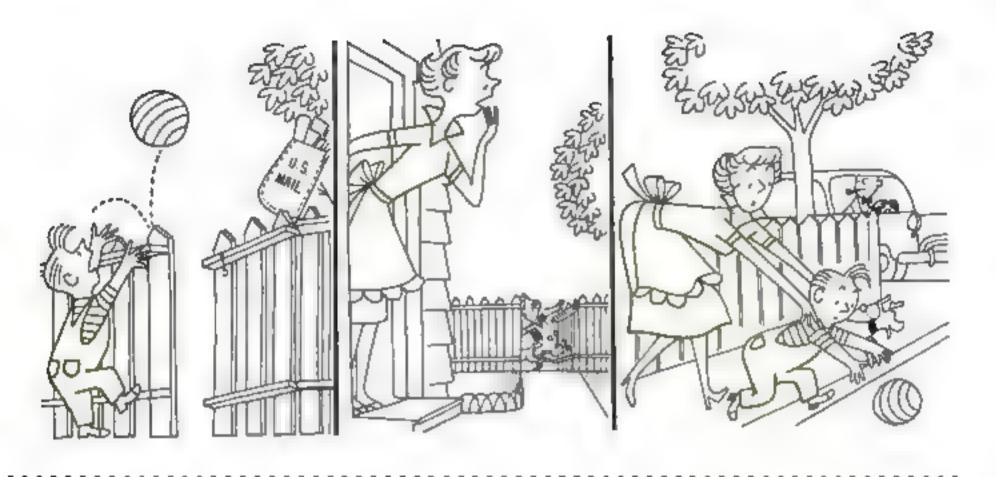


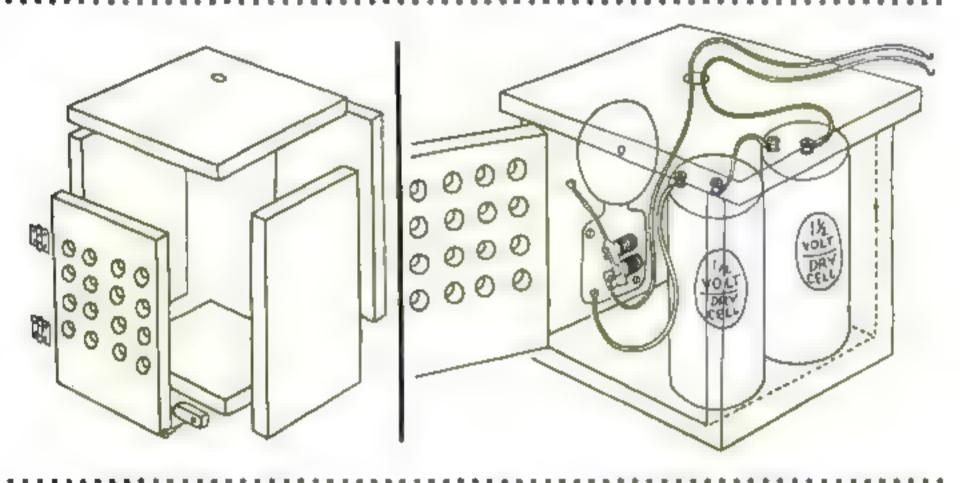
By Roy Doty and Herbert R. Pfister













Next Month: A quickly made periscope for parade-watching kids

MAY 1958 149

Ordering a House from the

Put prefabs on your shopping list for a new home. They offer endless variety—and you can pick from a catalogue

By John L. Springer

BOUT one of every 10 houses put up in the U.S. this year will be factory built. Next year you can expect even more. Housing experts believe that it won't be long before as many as half of all new housing units will be ordered from catalogues and come off assembly lines.

Prefabs today are not look-alike cheeseboxes. They have individuality. More than 100 manufacturers offer them in thousands of designs for your choice. These range from modest \$5,000, twobedroom cottages to plush jobs costing more than \$50,000. You can get any style you want-ranch, split-level, two-story colonial, a house designed for a hillside, a house with a basement or without. Inside plans are as varied.

You can have designs by such top-name architects as Frank Lloyd Wright and Royal Barry Wills, Or, if you want to design your own prefab, some manufacturers offer a basic plan. You add here, subtract there, and they supply the components

to fit.

The chances are that you have seen and even been in prefabricated houses, perhaps without knowing it, more than likely in a small development of a local dealer-builder who has the agency for one of the prefab manufacturers. Most of these dealer-builders also will put an individual

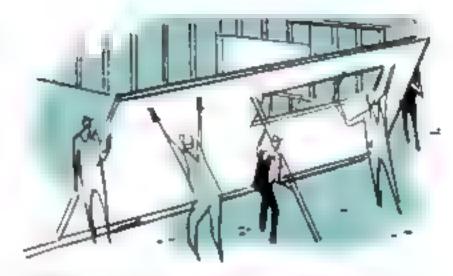


Next Month: "Will You Have Enough Water?" If you plan to move beyond the local water main, your source probably will be a well. June PS tells you what to look for and how to make your own tests. BEFORE YOU BUY OR BUILD



A primer of basic points about factory-built houses

Factory production of house parts and subussemblies has advantages for both builder and buyer. Even more points in favor of this modern type of construction seem likely as the fabricators gain experience. One point that surprises many—prefab construction can be just as high in quality as the best custom building. There's no reason for shoddiness.



Built-in stressing of big wall panels and roof sections adds strength to whole house.



Variety of style and plan can be created from basic units to suit your own taste.



House goes up fast. Prefab roof usually can be erected between sunrise and sunset.

prefab on your own land, to your order.

Construction is solid. Some home seekers shy away from prefabs because they associate the idea with cheap construction. Yet they may feel no qualms about buying in a big development where the builder makes his profit by using many of the same mass-production economies as the prefab manufacturers. Prefabs are just as solidly built as the average house, frequently even better. There's a reason.

Most prefab manufacturers build walls in sections 20 to 24 feet long. They use exterior sheathing and interior wallboard that span great distances and give extra bracing strength. The same with roof sections. And these wall and roof sections are built on jigs that don't permit dimensional differences. Wall panels must be square and true in all dimensions. When a house is built on the site, the best of carpenters are bound to slip up now and then.

Prefab sections, on the other hand, don't leave the factory until they have passed a rigid inspection. Perfect fit is inherent in a good prefab house. It must fit—and that's pretty good insurance that you'll get seasoned lumber, too.

Local building codes are designed to protect you from jerry-built housing by specifying what size floor joists and roof rafters must be used, how thick a foundation must be, and so on. Prefab builders must abide by the regulations just like other builders.

More for your money. A big prefabber buys the whole output of a lumber mill—at lower prices. Using an assembly line, he can turn out a product cheaper than one put together piece by piece. Besides this, fewer costly man-hours of skilled labor are needed to assemble the structure

A big prefab offers more chance for saving than a small one. That's because many costs—price of the lot, landscaping, kitchen and bathroom equipment—are about the same whether the house is small or large. In a big house, however, the percentage of money-saving factory-built parts is greater.

There's a wide choice. Suppose you see a house plan you like, but would prefer some changes. Most prefab firms will allow you to make variations so that you wind up with practically a custom-built job. You can change the overall size of the house and the sizes of individual



Prefab techniques offer more dollar savings in a big house than in a small one.



Factory-production of units in jigs makes suce they'll fit tightly when assembled.



Price is not fixed. Labor costs in different parts of the country are a big factor.



When finished, most prefab houses look just like any other. That's your proof of quality.

rooms, change a hip roof to a gabled roof, or move the living room from the right to the left. You can choose from a wide variety of sidings, shingles and color treatments. Usually you can get a choice of basement or no basement, one- or two-car attached garage, carport, or no car storage at all.

Housing in a hurry. Once the builder has his foundation set and the prefab panels and other components are delivered from the factory, he usually can get the roof on in one day. He's not held up by bad weather, and can finish a house quickly. In most cases you can move in six weeks after you sign the contract. A house built in the conventional way may take three months or more to complete.

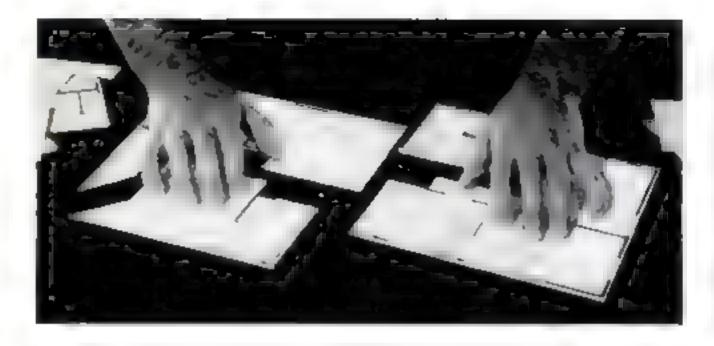
Building the house. The "package" that is delivered from the prefab factory usually consists of exterior walls with windows and doors in place, roof and floor sections, and interior partitions. The builder lays the floor, erects the wall panels, and puts on the roof in a special way in which he has been trained by the factory experts. The rest of the work, such as tiling, installing cabinets, painting, is done as in any other house.

Some manufacturers, such as National Homes, insist that their own builder-dealers do all the structural work. Other manufacturers don't mind if you make a deal to do your own foundation, plumbing, wiring, painting.

For experienced do-it-yourselfers, Place Homes has a special program they call "sweat-equity." Certain work done by the home buyer himself either covers some of his down payment or reduces the basic amount of his home loan.

Financing is no problem. It wasn't so long ago that a conservative banker wouldn't consider underwriting mortgages on prefabs. Today, representatives of many of the country's top banks say they'll lend money on a prefab as readily as on any other house. The bigger prefab manufacturers have taken matters in their own hands. They shop for the best mortgages, and can often offer a better financing deal than a local builder.

Locating a builder. Finding a builderdealer for a certain make of prefab you are interested in may not be easy. If it weren't that the prefabbers themselves think of "prefabrication" as a naughty word, you might simply look in the classi-



selection of templates for five basic interior plans are offered by American Houses. You can juggle these around like a jigsaw puzzle until you come up with the solution — your home. There are also six different exteriors, to provide further variety.

fied phone book. But many of them hide under such headings as "manufactured homes," "engineered houses," "pre-assembled homes," and other chesty titles. If you have trouble, you can get a list of the major manufacturers from the Prefabricated Homes Manufacturers Institute, 1117 Barr Building, Washington 6, D. C. Then, by writing to the manufacturer, you can get the names of dealers near you.

Prices are not firm. If you think factory houses have standard prices like stamps at the post office, you couldn't be more wrong. Often a house put up by one builder will be priced a full 10 percent below that charged elsewhere. Prices vary from builder to builder and from town to town.

"We cannot control prices from the factory," one executive explained, "A house in Westchester County, N. Y., will be far more expensive than the same model in Robinson County, N. C., because labor costs vary so much in the two places."

Getting prices from different dealers on an identical house in the same area is no cinch, either. You've got to make sure that they are bidding on the same thing. Some builders include tiled bathrooms, others don't; some use better grades of material for extras. Some manufacturers do not include plumbing, heating or wiring equipment in their package. In such cases, the local man must supply his own. So one quote you get may include the cheapest fixtures, another top grade.

Local code may boost costs. Building restrictions in your area may prevent prefabbers from using some new cost-cutting materials and methods. Here's an example: Several house manufacturers have developed utility cores with all the plumbing grouped in a compact unit. This slashes the cost of assembling and installing the same equipment on a piecemeal basis. But many communities won't allow such units. Similar restrictions prevent the prefabbers from using industry-approved, but locally prohibited, lower-cost wiring or different-size studs. Prefabs designed to take advantage of these "forbidden" methods may cost more than a conventional house when they have to be modified on site.

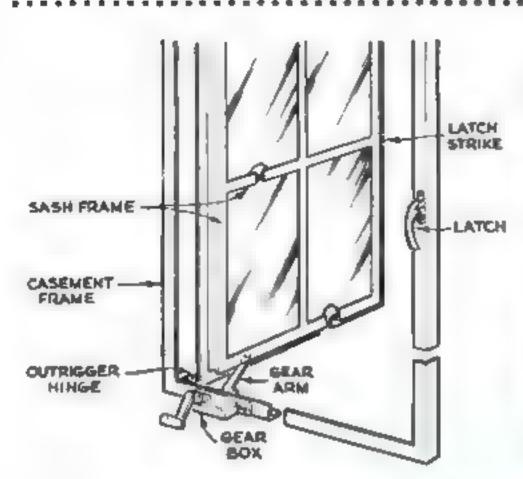
Seeing is not always believing. As in development houses, the selling bait in prefabs probably will be a model, or sample, house. Beware: "All is not gold that glisteneth." There may be no intent to deceive, but you may be sure that this showcase item has been prettied up and placed to its best advantage. But it's not the house you're going to pay for and live with. So check all the specifications. Be sure that you have a complete understanding of exactly what you are going to get, and that it is all in the contract before you sign a purchase order.

Prefab builder-dealers, however, have a reliability factor beyond their own conscience. They can't take a chance on losing a valuable franchise from the manufacturer. And the manufacturer, guarding his reputation, thoroughly investigates a dealer before signing him up.

Steel casements? Windows of this type last a long time but they do sometimes give trouble. To keep them working right, you'll want to save the data sheets that follow—along with other pieces for your Fix-it File that appear monthly in POPULAR SCIENCE.

Next Month: Faucet sprays.

Popular Science Fix-It File



A STEEL CASEMENT WINDOW will outlast the house if it is periodically maintained. Its worst enemy is rust. A tiny spot can spread unnoticed beneath the paint until, suddenly, the paint flakes off and you're left with a rusty window.

At the first sign of rust, sand and wire-brush the entire frame, protect it with a coat of red lead or rust-resisting paint and finish with a good exterior paint. Avoid straining or damaging the mechanism, keep the window working smoothly. If you must force the crank to open or close it, take this as a sign the window needs attention, and see what's wrong.

To make windows fit tightly . . .



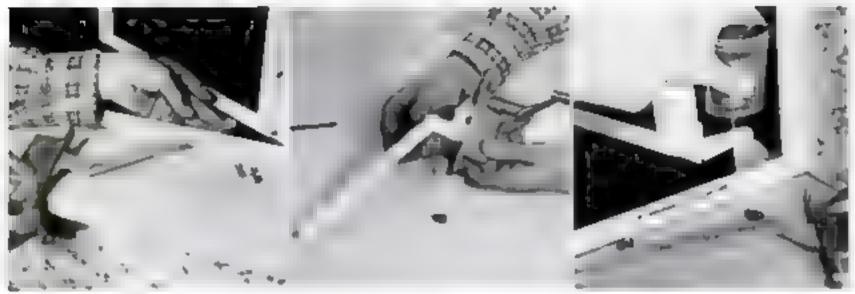
SCRAPE PAINT BLISTERS or rust scales off meeting surfaces of frame and window (left). Adjust strike plate to make the latch pull the window snug against the frame when closed. Oversize screw holes (center) make

CHECK FOR SPACES between frame and window with a strip of heavy paper. Condensation sometimes drips down, freezes and expands, bending frame away from the window.

adjustment simple. If this doesn't produce a tight closure, or if the screws are rusted in and can't be loosened, bend the lip of the strike plate inward, as at right, so the latch cam will bring the door in closer.

semp FRAME SUGHTLY with an adjustable wrench to make it fit soug against the window. Recheck with paper strip until you're sure you have a draft-free enclosure.

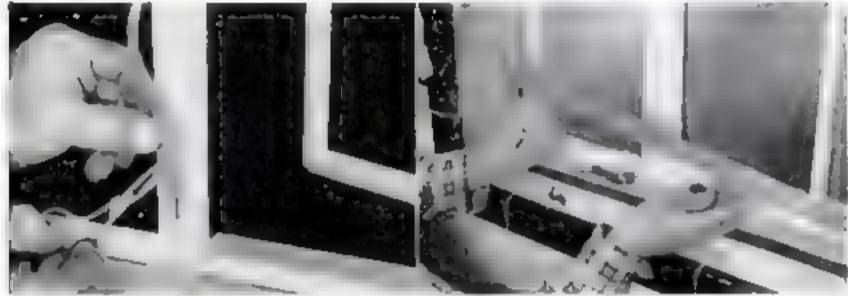




CLEAN AND LUBRICATE GEAR BOX once a year.
Remove screws holding gear box to frame (left photo) and slide the swing-arm out of the window groove. Remove the shouldered screw that holds the gears in mesh (center)

and wash parts in kerosene. Lubricate with heavy motor oil or light grease, and reassemble. Oil hinge pivots (right) and swing the window in and out to free them. Grease the window groove before replacing arm.

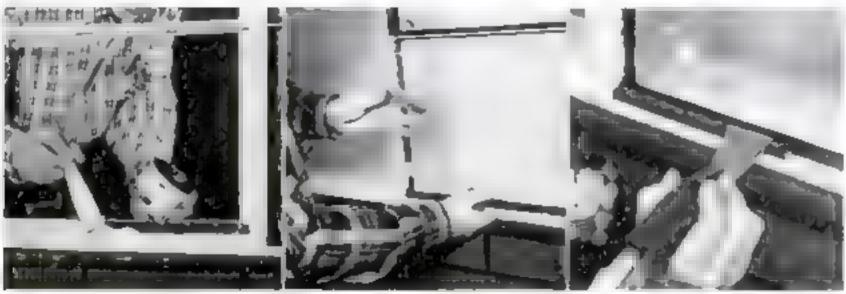
How to seal casement windows



USE THIN PLASTIC WEATHERSTRIPPING to solve metal-to-metal closing problems. Cut strips to length and miter corners to fit frame. Cement the plastic in place with the special vinyl adhesive supplied with it.

INSTALL STORM SASH inside casements. Sash slides in track screwed to sides and top of the window jamb. Bottom track snaps in place between the sides, is removable with windows to keep the sill clear in summer.

How to glaze casements



PREPARE THE SASH FRAME before setting glass in it. Remove rust with sandpaper and paint the metal. Apply a thin, even layer of elastic glazing compound around the frame (left photo). It comes in black or white to match paint. Press the glass firmly in place

(center) and squeeze out any air pockets. Fmish by applying the glazing compound outside the glass, smoothing it to a uniform slope with a putty knife (right). Glass for metal casements can be purchased in stock sizes at most hardware stores.

The New Outboards: Complete Facts Consumer and Figures News

By John Kingdon

HILE auto makers have been quietly easing their foot off the horsepower pedal, no such conservatism has come over the outboard boys. Their own private horsepower race, begun only about four years ago, now threatens to break wide open in a glittering array of the most powerful stock

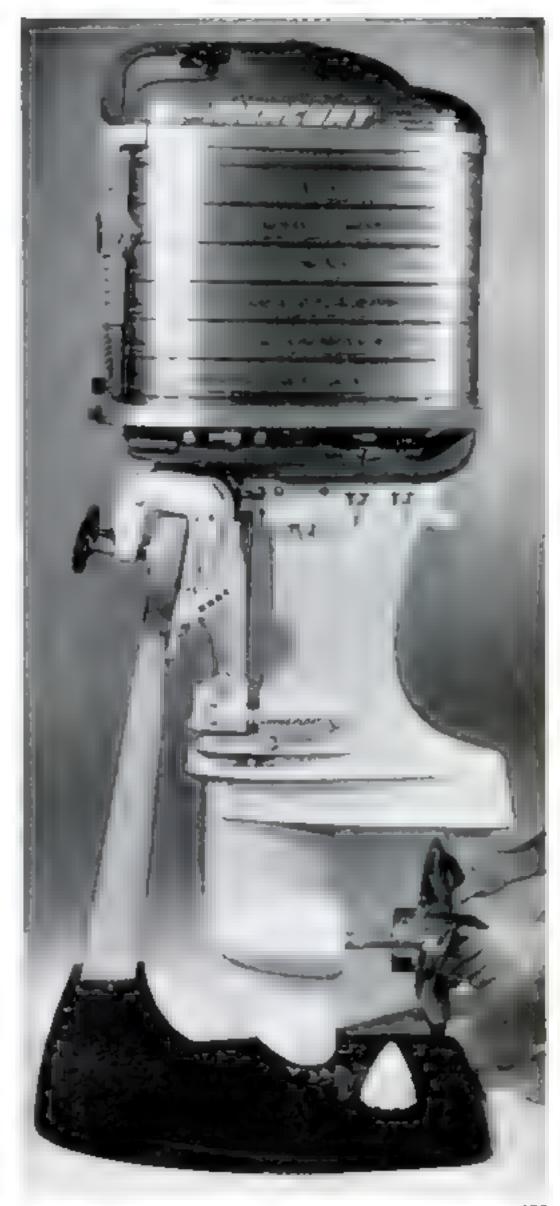
engines ever built.

Mercury, which only last year jolted the industry with its 60hp. motor, is again leading the pack with a staggering new 70hp. model—most powerful in the business today. Both Johnson and Evinrude have jumped 15 hp. over last year, hiking their top mills to 50 hp. Biggest boost has come from Scott-Atwater, which offers 20 hp. more than last year in a whopping 60-hp. engine for 1958.

Is the end in sight? Not by a long shot, according to such power pioneers as Carl Kiekhaefer, proprietor of the mighty Mercury stable: "Development of larger outboard hulls has long been limited by the lack of adequate horsepower. Thirty-foot outboard boats are now not only feasible, but a reality. We are ready to offer boat owners further substantial horsepower increases as soon as boat development warrants them."

Are higher horsepowers really justified? From many men in the industry the answer is a big

MIGHTREST MOTOR: New 70-hp. Mercury at right leads outboard race with highest power, yet has lowest weight to hp.—an astonishing 2.5 lb. Total weight is 183 lb. Price: \$960.



yes. The arguments they put forward are persuasive:

 There's more room to expand speed and size on water than on the slickest concrete cow path.

 Unlike autos, boats carry bigger payloads—more people, that is—as they go

up in size and power.

 And finally, those who favor large outboards over inboards for their greater



UNIQUE THREE-CYLINDER DESIGN, first in the U.S. gives this Scott-Atwater a remarkable 60 hp., second only to Merc. At 160 lb., it is the lightest of today's outboard behemoths.

safety and easier handling reply with a simple: "How else can you sling half a hundred horses in the trunk of a car and cart them to the beach for a weekend cruise?"

More horses, but from where? While most motor makers are agreed on heftier horsepowers, they are by no means agreed on where to get them. Result: the most widely diverging engine designs in outboard history.

Mercury gets its 70 horses from six inline cylinders with a displacement of 66 cu. in. Scott-Atwater, with half as many cylinders and slightly less displacement (63 cu. in.), coaxes out 60 hp. Johnson and Evinrude (both made by Outboard Marine) are pioneering four-cylinder V- type engines with the highest displacement of all (70.7 cu. in.) to provide their 50 horses.

Why the differences? In the power-hungry, fiercely competitive outboard business, each design represents a different solution to essentially the same problem; high power without the pounding vibration of pistons slamming back and forth. As you add cylinders, you smooth out this vibration by more evenly distributing the power strokes on the crankshaft.

Since all US. outboards but one (Fageol) are two-cycle engines with a power stroke every revolution of the crankshaft, their power patterns are identical to four-cycle car engines of twice as many cylinders with a power stroke every other revolution of the crankshaft. Thus a three-cylinder outboard is theoretically as smooth as an automotive six, a four as smooth as an eight, a six as smooth as a 12.

Kiekhaefer's fast-stepping 70-hp. Mercury Mark 78 is a product of the lots-of-small-cylinders-instead-of-a-few-big-ones theory. An outgrowth of last year's 60-hp. Mark 75, it stacks six small-bore (2 9/16") cylinders in an in-line row, which Kiekhaefer claims to be the quietest, smoothest-running design going

His results are impressive: an amazing 1.1 hp. per cubic inch of displacement and the lowest weight per horsepower in the industry—2.5 lb. The engine is tall and slim, permitting twin side-by-side installations with as little as 16" between pro-

peller centers.

Scott-Atwater, also an advocate of the in-line design, has gained an impressive 20 hp. by in effect tacking a third cylinder onto last year's two-cylinder 40-hp. power plant. And while Scott-Atwater doesn't share Kiekhaefer's passion for relatively small cylinders (3 \\ '\'a'' bore to Merc's 2 \(9/16'' \)), its engine's weight per horsepower is a very respectable 2.66 lb.—only a shade higher than Merc's.

The counterattack. While the in-line design is admittedly smooth, both Johnson and Evinrude are making a good case for their new four-cylinder, 50-hp. V engines. In-lines, they argue, tend to stretch out the engine block because the cylinders are strung in rows. The V design is compact and the b'ock is rigid

Chief criticism of the V engine has always been that it is not as inherently well balanced as the in-line (because of the

P. And	4 20 27	A C	NO OF CYLINDERS	BORE 4 STROKE (inches)	DISPLACEMENT (cubic Inches)	REVERSE (pivot or poorshift)		FUEL TANK		-	
OUT	958 BOARD PECS						STARTING (manual or electric)	CAPACITY (gallons)	TYPE [Integral or remote]	ENGINE WEIGHT (pounds)	PRICE
BUCCAMEER	3 Deluce 5 Standard 5 Deluce 12 Standard 12 Deluce 25 Deluce 25 Electric 35 Electric	3 @ 4000 5 @ 4.000 12 @ 4.000 12 @ 4.000 25 @ 4.000 25 @ 4.000	INNNNNNN	2·1/8 x 1·1/2 1·15/16 x 1·1/2 1·15/16 x 1·1/2 2·1/4 x 2·1/4 2·1 4 x 2·1 4 2·7 8 x 2·3 4 2·7 8 x 2·3/4 3·1/16 x 2·3/4	5.32 8.84 8.84 17.89 17.89 35.7 35.7 40.5	D.v. piv gear gear gear gear gear	man. man. man. man. man. elec elec	0 5 0 8 4 25 2 6 6	int. int. rem int. rem. rem. rem. rem.	32 46.5 51 69.5 77.5 119.5 130 134	\$140.0 \$185.0 \$230.0 \$325.0 \$350.0 \$465.0 \$555.0 \$585.0
ELŴIM	5823 5953 5973 5896 25 Electric 5944 5982 5990	2 @ 4,000 5 \$ @ 4	TONNING WOOD	1-3 4 x 1-9 16 2 x 1-11/16 2-1 8 x 1-11/16 2-3/8 x 2 3 x 2-2/3 3-1/8 x 2 706 3-1/8 x 2 706 3-1/8 x 2.706	3 76 10 6 11 97 17 72 37 72 41 49 41 49 41 49	piy 1607 1607 1607 1607 1608 1608	man. man. man. elec man e.ec elec	0 625 4 25 4 25 6 6	rem rem rem rem rem rem	28 56 56 61 118 118 130 130	\$ 95 9 \$204 9 \$229 9 \$279 9 \$354 9 \$444 9 \$514 9 \$554 9
EVINRUDE	Docktwin L Entwin Fisherman Fleetwin Sportwin Fastwin Std Fastwin E ec Big Twin Std Big Twin Eiec Lark Four Fifty Starfite	3 (c. 4.000 3 (c. 4.000 5 5 (c. 4.000 7 5 (d. 4.000 10 (d. 4.000 18 (d. 4.500 35 (d. 4.500 35 (d. 4.500 35 (d. 4.500 35 (d. 4.500 50 (d. 4.000 50 (d. 4.000	KENNMMMMALL	1-9/16 x 1 3 8 1-9/16 x 1 3 8 1-15/16 x 1-1/2 2-1/8 x 1-3/4 2-3 8 x 1-7/8 2-1,2 x 2-1/4 2-1/2 x 2-1/4 3-1/16 x 2-3/4 3-1/16 x 2-3/4 3-1/16 x 2-3/4 3 x 2-1/2 3 x 2-1/2	5 28 5 28 8.84 12.4 16.6 22 22 40 5 40 5 70 7 70 7	piv piv. gear gear gear gear gear gear gear	man man man man man elec man erec elec man e ec	0.61 0.61 4.25 4.25 6.6 6.6 6.6	int rem rem rem rem rem rem rem	33 33 56 59 66 80 87 123 129 136 197 205	\$160 00 \$160 00 \$230 00 \$270 00 \$310 00 \$395 00 \$475 00 \$495 00 \$585 00 \$625 00 \$740 00 \$840 00
FASEOL	144.1	35 @ 5,200	4	2-1/2 x 2-1/4	44	gear	elec	6.2	rem	190	\$867 D
INCSTONE	3.6 5 10 16 38	3 6 @ 4 000 5 @ 4,200 10 @ 4,200 16 @ 4,200 38 @ 4,800 38 @ 4,800		2-1/8 x 1-3/4 1-11/16 x 1-43/54 2-11/64 x 2 2-11/32 x 2-5/16 3-1/16 x 2-3/4 3-1/16 x 2-3/4	6.21 7.48 14.82 19.95 40.51	cone gear gear gear gear	man man man man man elec	1 3 5 6 6 6	int fem fem fem fem	36 42 59 68 117	\$125 00 \$225 00 \$320 00 \$365 00 \$499 93
HIAWATHA	3.6 5 7.5 10 16 38 38	3 6 @ 4,000 5 @ 4,200 7 5 @ 4,200 10 @ 4,200 16 @ 4,200 38 @ 4,800 38 @ 4,800	Name was the	2·1/8 x 1·3/4 1·11/16 x 1·43/64 2 x 1·3/4 2·11/64 x 2 2·11/32 x 2·5/16 3·1/16 x 2·3/4 3·1/16 x 2·3/4	6.21 7 48 11 14.82 19 95 40 51 40 51	none gear gear gear gear	man man man man man. man. elec	1 3.5 6 6 6	rem. rem. rem. rem. rem.	36 45 59 66 79 128 137	\$109 99 \$209 99 \$239 99 \$319 99 \$349 99 \$509 99
HOSMHON	Sea Horse 3 Sea Horse 5-1/2 Sea Horse 7-1/2 Sea Horse 10 Sea Horse 18 Sea Horse 18 Sea Horse 35 Sea Horse 35 Sea Horse 35 Super	3 @ 4,000 5 \$ @ 4,000 7 \$ @ 4,000 10 @ 4,000 18 @ 4,500 35 @ 4,500 35 @ 4,500	NESSTANSON S	1-9/16 x 1-3/8 1-15/16 = 1-1/2 2-1/8 = 1-3/4 2-3/8 = 1-7/8 2-1/2 = 2-1/4 2-1/2 = 2-1/4 3-1/16 = 2-3/4 3-1/16 = 2-3/4 3-1/16 = 2-3/4	5.28 8.84 12.4 16.6 22 22 40.5 40.5	ply. gear gear gear gear gear gear gear	man man man man man elec man elec	0.61 45 45 6 6	int rem. rem. rem. rem. rem. rem.	33.25 56 59 67 77 87 123 129	\$160.00 \$230.00 \$270.00 \$310.00 \$395.00 \$475.00 \$495.00 \$585.00
	Sea-Horse 50 Super	50 @ 4,000	V-4	3 x 2-1/2	70 7	gear	man.	6	rem	197	\$740.00
HERCURY	Sea-Horse 50 Mark 6 Mark 10 Mark 25 Mark 28 Mark 30 Mark 30M Mark 55M Mark 55E Mark 55E Mark 55E Mark 55E Mark 58E Mark 58E Mark 58E Mark 75S Mark 75S Mark 75E Mark 75E Mark 78E Mark 78E Mark 78E	4.000 6 10 20 20 40 40 40 40 50 50 50 50 50 50 50 50 50 50 50 50 50	* *****************	3 x 2-1/2 1 3/4 x 1 1/2 2-11/32 x 2-1/8 2-7/16 x 2-1/8 2-9/16 x 2-1/8 2-7/16 x 2-1/8 2-9/16 x 2-1/8 2-9/16 x 2-1/8 2-7/16 x 2-1/8 2-9/16 x 2-1/8 2-7/16 x 2-1/8 2-9/16 x 2-1/8 2-9/16 x 2-1/8	70 7 18.5 20 22 30 30 40 40 40 40 40 44 44 44 44 44 44 60 60 60 66 66 66	PIV. Sear. Sear Sear Sear Sear Sear Sear Sear Sear	elec. man, man, man, man, man, man, elec,	325	rem. rem. rem. rem. rem. rem. rem. rem.	205 42 56 75 79 210 105 111 116 120 109 114 123 122 127 131 134 152 164 168 171 180 183	\$225 00 \$330.00 \$380.00 \$430.00 \$479 00 \$540 00 \$565 00 \$655 00 \$655 00 \$680 00 \$750 00 \$780.00 \$780.00 \$780.00 \$780.00 \$780.00 \$780.00 \$780.00 \$780.00 \$780.00

150	958	HORSEPOWER (at r.p.m.)	NO. OF CYLINDERS	BORE & STROKE (inches)	DISPLACEMENT (cubic Inches)	REVERSE (pirot or gearshift)	STARTING (manual or electric)	FUEL TANK			
OUT	BOARD							CAPACITY (gallons)	TYPE (integral or remote)	ENG NE WEIGHT (pounds)	PRICE
MEPTUNE	Mighty Mite	17@4,000	1	1-9/16 x 1-1/2	2 94	Hone	man.	0.25	Int	1.7	\$ 89 50
OLIYER	6 16 16 16 35	6 @ 4,500 16 @ 4,500 16 @ 4,500 35 @ 4,500	Newson	2 E 1-1/2 2-1/2 E 2-1/32 2-1/2 E 2-1/32 3-1/16 E 2-7/8	9.42 19.94 19.94 42.35	gear gear, gear, gear,	man. man. elec. elec.	3.5 6 6	rem. rem. rem.	50 79 79 125	\$235.00 \$385.00 \$475.00 \$642.00
ECOTT- ATWATER	Scotty Thritty Scott Fishing Scott Family Scott Special Scott Sports Scott Sports Scott Super Scott Super Scott Royal Scott Flying Scott	3.6 @ 4,000 5 @ 4,200 7 5 @ 4,200 10 @ 4,200 16 @ 4,200 22 @ 4,800 40 @ 4,800 40 @ 4,800 40 @ 4,800 60 @ 4,800		2-1/8 x 1-3/4 1-11/16 x 1-43/64 2 x 1-3/4 2-11/64 x 2 2-11/32 x 2-5/16 2-11/16 x 2-7/16 2-11/16 x 2-7/16 3-1/8 x 2-3/4 3-1/8 x 2-3/4 3-1/8 x 2-3/4	6.23 7.48 11 14.82 19.95 27.65 27.65 42.18 42.18 42.18 63.27	none gear gear gear gear gear gear gear gea	man man, man, man man elec man, elec elec, elec	3.5	int. rem. rem. rem. rem. rem. rem. rem. rem	36 50 60 65 80 107 119 130 142 142 160	\$134.00 \$242.75 \$277.25 \$324.50 \$384.25 \$448.50 \$563.50 \$538.50 \$663.00 \$749.00 \$979.50
SEA DEE	3 Deluxe 5 Standard 5 Deluxe 12 Deluxe 25 Deluxe	3 @ 4,000 5 @ 4,000 5 @ 4,000 12 @ 4,000 25 @ 4,000		2-1/8 x 1-1/2 1-15/16 x 1-1/2 1-5/16 x 1 1/2 2-1/4 x 2 1/4 2-7/6 x 2-3/4	5.32 8.84 8.64 17.89 35.7	piv. piv. gear gear, gear.	man man man man, man,	05	int int rem. rem.	32 46 52 77	\$135.95 \$183.50 \$216.95 \$361.95 \$466.95
SHIR ASS	3 De use 5 Deluxe 12 Deluxe 25 De uxe 35 Twin	3 @ 4 000 5 @ 4,000 12 @ 4,000 25 @ 4 000 35 @ 4 500	- PASSES	2-1/6 x 1-1/2 1-15/16 x 1-1/2 2-1/4 x 2-1/4 2-7/6 x 2-3/4 3-1/6 x 2-3/4	5 32 8 64 17 69 35 7 40 5		man man, elec elec, elec	0.5 1 6 6	int. ini rem. rem	32 52 77 5 119	\$117 00 \$186 00 \$309 00 \$414 00 \$585.00
SPORT	Standard Deluke	2 5 @ 4 200 2 5 @ 4,200	1	1 5/8 x 1-5/8 1-5/8 x 1-5/8	3 46 3.45	piy piy,	man.	0 625 0 625	ent	22 22	\$ 89 95 \$ 99 95
WEST BEND	Shrimp Pike Muskie Barracuda Shark Shark Shark Shark	2 @ 4,000 6 @ 4,500 8 @ 4,500 12 @ 4,000 35 @ 4,500 35 @ 4,500 35 @ 4,500	NO SERVICE	1-3/6 x 1-9/15 2 x 1-11/16 2-1/8 x 1-11/16 2-3 x x 2 3-1/8 x 2 706 3-1/8 x 2 706 3-1/8 x 2 706 3-1/8 x 2 706	3.76 10.60 11.97 17.72 41.49 41.49 41.49	piv. gear gear gear gear gear gear	man man man man, elec elec elec	0 625 4.5 4.5 6 6	ent rem rem rem rem rem.	28 56 57 59 118 132 136 5	\$119 95 \$249 95 \$275.00 \$349 95 \$495 00 \$585 00 \$615 00 \$635 00
ERASIW	5-1/2 Powermatic 15 Powermatic 35 Powermatic 35	5 5 4 200 15 4 4.200 35 4 500 35 @ 4,500	SAGA	2 m 1-1/2 2-1/2 m 2-1/32 3-1/16 m 2-7/8 3-1, 16 m 2-7/8	9 42 19 94 42 35 42 35	gear, gear gear gear	mañ mañ mañ esec.	35 65 65		55 75 125 .25	\$210 00 \$339 50 \$445 00 \$595 00

Who's who in the outboard race

On this and the previous page are listed specifications for U.S. outboards by brand name. In order to tell who makes and distributes each brand, here's how they stack up:

Buccaneer: Gale Products, Galesburg, Ill.,

a division of Outboard Marine Corp.

Elgin: Made by West Bend Aluminum Co., Hartford, Wis, Distributed by Sears, Roebuck and Co., Chicago.

Evinrude: Evinrude Motors, Milwaukee,

a division of Outboard Marine Corp.

Fageol: Fageol Marine Engine Co., San

Diego, Cal

Firestone: Made by Scott-Atwater Mfg. Co., Minneapolis 13. Distributed by Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron 17, Ohio.

Hiawatha: Made by Scott-Atwater Mfg. Co., Minneapolis 13. Distributed by Gamble-

Skogmo stores.

Johnson: Johnson Motors, Waukegan, Ill.,

Mercury: Kiekhaefer Corp., Fond du Lac, Wis.

a division of Outboard Marine Corp.

Neptune: Muncie Gear Works, Inc., Muncie, Ind.

Oliver: The Oliver Corp., 108 S. McCamly St., Battle Creek, Mich.

Scott-Atwater: Scott-Atwater Mig. Co.,

Minneapolis 13.

Sea Bee: Made by Gale Products, Galesburg, Ill., a division of Outboard Marine Corp. Distributed by Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron, Ohio.

Sea King: Made by Gale Products, Galesburg, Ill., a division of Outhoard Marine Corp. Distributed by Montgomery Ward, Chicago.

Sport: Comanco, Inc., Washington Blvd.

at Motor Ave., Culver City, Cal.

West Bend: West Bend Aluminum Co., Hartford, Wis.

Wixard: Made by The Oliver Corp., 108 S. McCamly St., Battle Creek, Mich. Distributed by Western Auto Supply Co., 2107 Grand Ave., Kansas City 8, Mo.

IGO POPULAR SCIENCE

angular placement of the cylinders). Both Johnson and Evinrude claim to have solved this problem, like Detroit, by adding counterweights to the crankshaft that offset the unbalancing forces. Their V-4s are thus as smooth-running as an automotive eight.

More glitter. Hand in hand with higher power has also come higher styling and the greatest array of convenience gadgetry since Detroit made the crank handle obsolete. Most top engines either come with electric starting or offer it as optional

equipment.

Scott-Atwater's 60-hp. Flying Scott may be as close as you'll ever get to automotive convenience. Its battery-generator electrical system, which eliminates the old spin-it-yourself magneto, is similar to that of Johnson, Evinrude and Mercury, but also has an honest-to-goodness automotive-type voltage regulator. A dashboard panel has a key-type starter awitch and two lights, one to signal battery discharge and the other to warn of overheating. With an added accessory, you can flip a switch on the dash and raise or lower the motor electro-hydraulically for launching, beaching or running through shallow water.

The Flying Scott's fuel system has a separate carburetor for each cylinder. At low and medium speeds, each cylinder draws from its own carburetor only, but at full throttle a new type of balance-tube manifold allows each cylinder to draw on all three carburetors. This is said to give the motor the widest range of breathing

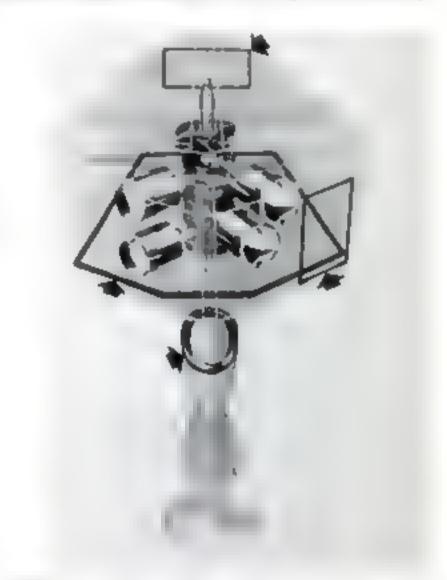
flexibility of any outboard.

Remote shift and throttle controls are standard equipment. The throttle and gearshift cables are operated by a single lever instead of separate levers. With this one lever, the motor is shifted from forward to neutral or reverse, and the speed is accelerated or retarded, greatly simplifying maneuvering around piers and in other tight spots. As in previous years, Scott-Atwater motors are fitted with Baila-Matic, an automatic bailer that operates independently of the cooling system and pumps up to 300 gallons an hour to keep the boat dry.

There's even power steering. Another new Scott-Atwater accessory is a special steering wheel that pivots the motor electrically. Since there's no mechanical connection between wheel and motor, there's no feedback of vibration or wave shock. As you let go of the wheel, the motor automatically returns to center position after each turn.

A portable plug-in hand control is also available. It lets you steer the motor from anywhere in the boat.

Mercury's new Mark 78 is direct-reversing like last year's Mark 75. Neither has a reverse gear; instead, a single lever with a built-in starter button governs start,



RADICAL V ENGINE, often tried but never put in production until now, is latest entry of both Johnson and Evinrude. It has four cylinders in borizontal V, weighs 205 lb., gives 50 hp. Arrows point to rubber seals (black outlines), said to insulate noise and vibration.

choke, forward, stop, reverse and throttle. When this lever is moved from forward to reverse, the engine actually stops and is restarted with the crankshaft rotating in the opposite direction. On the 70-hp. Mark 78, the choke is automatically actuated when the starter button is pressed; on the 60-hp. Mark 75, it's operated by the ignition switch.

New this year on the larger Mercury motors are hydraulic automotive-type shock absorbers that snub the violent kickup of the motor and cushion its rebound when boat and motor strike an obstruction in the water.

There's also a new safety tilt switch [Continued on page 244]





New two-in-one rotating rise quickly provides metal-working jaws in the up position shown above and woodworking jaws in the down position at left. Woodworking jaws are 7" wide, open to 612" and—by a unique designermain partly open even when metal jaws are fully closed, to prevent scoring the wood Both the metal and hardwood jaw inserts are replaceable in the E. H. Sheldon vise. A socket in the woodworking end also takes a metalworking anvil or clamping pins to exert pressure on large work... A screwdriver with built-in flashlight, or a flashlight with a built-in screwdriver (whichever way you want to look at it; it serves as either one separately) is available from Silver Bells for \$2.95. It takes regular flashlight batteries, has four interchangeable bits—two standard and two Phillips.... Stanley, which believes in facing facts, also has a new line

of screwdrivers with built-in shock absorbers. As the company puts it diplomatically, "They're for all of us who know that screwdrivers shouldn't be pounded but who still occasionally do it anyway"....

Faster drilling of concrete is now possible with the Ramset tool at right. Available only to professionals until now, it consists of a steel barrel and plunger that quickly drives either a masonry drill or stud fasteners directly into concrete. The new homeowner version sells for \$12.95.... If you need odd-size drill bits, Hayden will sell you any one you want from .015" to 1" di-



ameter in steps of—believe it or not—.001"... Rethreader taps with hex-shaped heads fit directly into open-end, box or socket wrenches for quick restoring of worn or damaged threads. Herbrand Tools makes the taps in six sizes from \(^1/4''\) to \(^1/4''\)... Irwin's new expanding wood bit lets you "dial" 35 hole sizes from \(^1/6''\) to 3" by simply spinning a wheel. It sells for \$3.80.

for your car

Evidence of the growing popularity of foreign cars: You can now buy European socket wrenches for either the metric or British Whitworth system from, of all people, that good old American institution, Sears, Roebuck. The sets have both \(^{1}\)/_{1}" and \(^{1}\)/_{2}" ratchet drive, fit such cars as the Volkswagen, Porsche, Austin, MG and Jaguar . . . Also from Europe come reflective road markers, shown below, that can be strung several hundred feet behind a car to warn approaching motorists when you have to make road-side repairs. The collapsible rubber triangles are faced with American-made fluorescent Scotchlite tape and are

More new products on the next page







not damaged if they should be accidentally run over. Ewald Kongsbak sells a set of seven for about \$6... A hydraulically driven fan blade (at left), gives you cooling at low speeds when you need it most, then cuts out at high speeds. This is said to reduce fan noise and save up to 10 hp. The secret? A fluid coupling in the hub lets the fan slip as engine speed increases. O. W. Dietz sells the fan for about \$35 to fit most V-8s since 1954. Another version, made by the Radiator Specialty Co., uses a centrifugal clutch to disengage the blade at high speeds...

Two new aids in spray cans: pushbutton car wax and whitewall cleaner, both by S. C. Johnson . . . You can add a plastic sports-car body to your car for \$300 to

\$500 from Almquist Engineering Co.

what's new for your home



Plastic domes for basement windows (at left) keep rain, snow, leaves and trash out of the wells, yet let in sunlight. The aircraft-like "bubbles" bolt to standard metal well liners and have an air gap above the ground that also provides ventilation. They're sold by Accro Plastics for about \$13... Fancier kitchen cabinets are the aim of new ceramic door pulls introduced by Stanley. The circular pulls come in two diameters—1¼" and 15%" and in blue, pink or yellow for 65 to 80 cents apiece.

You can install a prefab garden pool by simply digging a hole and dropping it in. The one-piece plastic Perma Pool is 41/2' long, 3' wide and 1' deep in a freeform shape. It sells for \$39.95 . . . A new folding door works like a Venetian blind turned on its side. Individual, 8"-wide wood louvers can be fully opened to let in light and air, partly opened to block sun but permit ventilation, or fully closed for complete privacy. The doors come 6'8" high and in widths from 2'4" to 4' for \$45 to \$65. They're made by Consolidated General Products . . . The curved troning board at left represents the first major design change in 90 years, says its maker, Arvin Industries. The arc shape is said to permit more natural, free-swinging arm strokes and a 28-percent larger work area. The board, which also has small wheels, sells for \$24.95.

for more information:

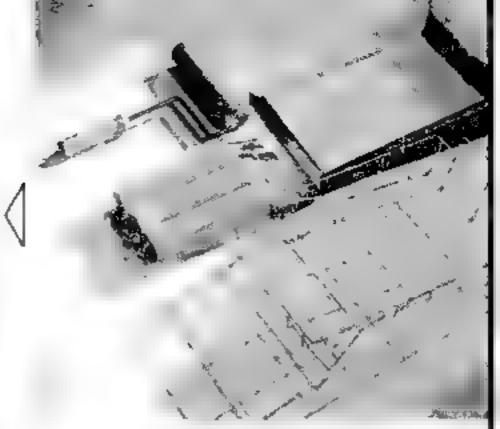
Here's where to settle if you can't get any item listed above: Acero Piastles, 37°2 & Funct on the fibrage to Almquist Engineering Co., Inc., Wilbord Pa., Aceta Industries, Inc., Cotombus, Ind., Bell & Howell, 100 McCormak Rd., Lincago 45. Consolidated General Products, 24th and Vicholson Sta-Houston & Lex., O. W. Dietz Engineering Co., 28749 Fiotal Roterate. 11th. Havden Twist Drill Co., Manua. 4th., Herbrand Division. Bingham Herbrand Corp. Fremont, Ohio; Irwin Auger Bit Co., Wilmington Ohio, S. C., Johnson & Son, Inc., Raine Will., Ewald Kongsbah, 269 Parthon, Luc-

for the handyman

They've finally done it: disposable point rollers and trays. The foam-plastic roller sleeves (at right) fit all standard 7" handles, can even be cleaned for re-use; but don't bother, says the maker, Harry Serwer—you can buy three for 79 cents. The trays are cardboard liners that fit into a wire basket. They're three for 45 cents...

You can "paint on" a new roof, according to claims for a new coating that combines aluminum, asphalt and asbestos fi-

bers. Made in eight colors by James B. Sipe, it's said to waterproof old roofs, seal cracks and reflect heat, lowering inside temperatures as much as 15 degrees... New wood-grained plasterboard comes with matching-color nails that make it unnecessary to hide heads or joints. U. S. Gypsum makes the panels in simulated cherry, walnut and pine.

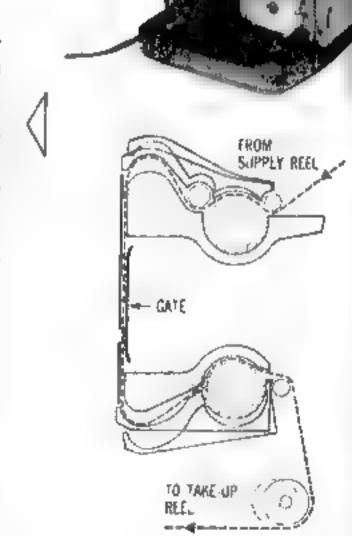


just for fun

Disposable sleeping bags, originally developed for U. S. Forest Service smoke jumpers, are now available. to the public for \$2.95 each. Made by National Fiber, they have a tough corrugated-paper outside with a cotton liner inside for warmth . . . The self-threading 8-mm. projector at right—first of its kind—lets you change reels in seconds. You simply feed the film into a slot and two plastic guides, shown in the drawing. channel it onto the sprockets. If the picture starts jumping because of faulty sprocket holes, a quick tap on the upper guide automatically rethreads the film without stopping the projector. The new Bell & Howell model is priced at \$129.95 with standard f, 1 6 lens, \$149.95 with a special lens that lets you vary picture size on the screen without moving the projector . . . A portable motorized barbecue spit runs on batteries and requires no bulky firebox. You simply build a fire right on the

ground and place the spit over it. LRK of California sells it for \$9.95.

Theldon gallager



beck. West Germany, L. R. K. of Cultiornia. 101 Recovered. Acc. Reduced City, (at. National Fiber & Cushioning Com. Reckingham. N. C., Perma Pools, P.D. Box 2084. Washington 16. D. C., Radiator Specialty Com. 1400 E. Independence Blyd., Charlotte 8, N. C.; Ramoet Fustening Systems, 12117 Beren Rd., Civeland 11, Sears, Ruebuch. & Co., 92. S. H.

New Acchelle, 5.), E. H. Sheldon Equipment Co., Mustegan, Machelle, 5.), E. H. Sheldon Equipment Co., Mustegan, Mach. Silver Bells Ltd., 1617 Del Mann Hed. Neg. 1de, Cal., James B. Nipe & Co., P.O., Box 8010, Pittshatgh 10. The Stanley Works, III Elot St., New Britain, Conn.; U.S. Cypenen Co., 100 E., Adams St., Chicago 6.



New Saw Has Many 'Firsts'

FOR \$229 (\$10 down, 20 months to pay), you can buy one of the hottest power tools to hit the market today—if you don't have to wait in line too long. Out only a few months, the slickly styled radial-arm saw above has already sur-

prised its maker—Sears, Roebuck—by selling so well that orders are hard to fill.

Why? Not even Sears is sure yet, but it figures. Two years in the making, the gleaming gold-and-chrome saw has a remarkable two-hp. motor—largest on a

saw of this price—and a 10" blade with 3" cutting depth.

All controls are in front for easy access, all are color-coded to match the parts they operate—you aren't likely to reach for the wrong knob. Also first on any saw, the new Craftsman has a unique ball-bearing motor mount that rides the arm with a feather touch. "Got the idea," say Sears engineers proudly, "from ball-bearing aircraft turrets."

MUSKY TWO-HP. MOTOR slides easily on 82 ball bearings, 41 on each side of carriage, (drawing at top of photo, left). Two-ended motor shaft is %" diameter at near end for saw blade, at far end takes ½" chuck or arbor for drilling, sanding, shaping and other operations.

ISS POPULAR SCIENCE

Is There a Used Car In Your Future?

Good used cars pack the lots. Many are recent and they come equipped. Here's how to shop

A good used car can sometimes be the best buy on wheels. The reason is depreciation. A buyer who goes for a new Belchfire 880 takes a big licking in the first few years of ownership, when his treasure may lose a third of its value—while traveling only a seventh of its life. So a used-car buyer, by letting someone else take the big depreciation licking, may get more transportation per dollar.

Drawbacks? There are three main ones: 1) The car usually won't be the latest model. 2) Big repair costs may come sooner than with a new car. 3) The innocent or unwary buyer gambles on buying a possible turkey. The following special section, designed to make you a savvy shopper on points 2 and 3, gives information on:

- The new warranty deals that are supposed to serve as lemon-insurance
 - Ways to finance a used car
 - Insurance coverage you should have
 - Tricks a professional appraiser uses
- How to evaluate and compare the condition of the three cars you like best



What about those used-car warranties?

MANY buyers of used cars can pull away from a dealer's lot nowadays without wondering, "How do I know I haven't bought a lemon?"

They'll find the comforting answer in their glove compartments, or in their mailboxes a few days later. It is a legal-looking document that says the buyer won't have to pay a cent for major mechanical defects for one year.

Where do you get it? The simplest way is to shop automobile row for used cars that carry a warranty. Another method is to check the yellow pages of a phone directory for a bonding firm, and query the company about local dealers.

National Bonded Cars, Inc., of Springfield, N. J., has about 5,000 dealers signed up. Car Warranty Corporation, New York City, is another giant in the field, and there are a number of others.

But don't bank on being able to get a warranty on any used car, or from any dealer. The bonding companies dole out their coverage only to the cream of the Crop.

How does it work? After a warranty company and a dealer decide to do business, an inspector shows up at the lot. He checks over the eligible cars, and only the ones he passes get warranties. This costs the dealer around \$40 a car, a cost usually passed on to the buyer.

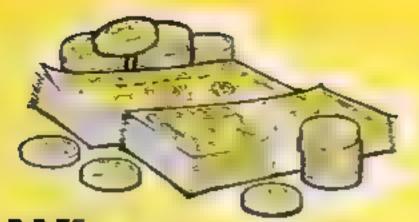
What does it cover? In general, the warranty company pays for one year for most major mechanical repairs. Car Warranty Corp., for instance, covers the parts in the engine, transmission, rear axle, clutch, steering and front-axle assembly, brakes, universal joints and water pump. Any one of these will be repaired or replaced, and the warranty company foots the bill, providing it's a job covered in the fine print.

To protect itself, a warranty company usually puts a few iffy sentences into its warranty. Car Warranty Corp. says that parts failure must ". . . result from defects in material or workmanship." Another hedge is the use you'll give your car You can forget about warranty protection if you register the car for commercial use, say for a business fleet operation.

Says the president of one: "We don't squawk about backing a typical harddriving traveling salesman. But we might back down about covering a heavy-hardware salesman who fills his back seat with a ton of samples."

Payment of repair bills is said to be fast, no longer than a day or two. The bonding companies suggest you take repair jobs to your original dealer. On a trip or vacation away from home, you can turn repair troubles over to the company's closest branch office.

Caution: There is one point to remember if you want to get this protection. A used-car warranty is like any other guarantee: Its legal prose and engraved paper can't protect you from a shady dealer or a weak bonding company. So ask your dealer for the facts about his warranty company.



Where will you get the money?

O NCE you've picked out the best used car on the lot, you'll need a source of cash. You'll want a finance plan that costs you as little as possible, with payments within your monthly budget and a reasonable interest rate.

A shrewd used-car buyer should have a couple of financial facts up his sleeve. The first: You don't have to finance the car through your dealer, or through any plan you don't like. Comparing the time-payment plans of your dealer, a bank and a finance company is only common sense.

On trade-in deals, the important dollars-and-cents figure to you is the "cash difference"—the net cost after you've deducted the trade-in allowance from the dealer's price tag.

Don't try to hold the dealer up for an exaggerated trade-in. He'll have to hike his total price to allow for it

Your down payment should be roughly a third the price tag on your used car. (That's true, too, when you walk in with a cash down payment.) "One-third down" is a must with most banks and conservative finance companies. It gives you an equity in the car that you can refinance if, later on, you want to stretch out your payment period.

Borrowing money to finance that "cash difference," you'll find, can vary in interest rates, "Rates are purely relative," says one banker. Here's what he means:

The borrowing cost is often higher for

an older car (10 to 14 percent) than for a shiny new showroom model (five percent to 12 percent). What's more, a salaried man can usually get a lower interest rate than an hourly paid worker.

Four different methods are used for financing a used car. In the order most

frequently used, they are:

Sales contract with a dealer. Here, everything is handled by the dealer. It cuts down the legwork and red tape for you. The most common drawback is higher cost: from 10 percent up.

Mortgage loan. You get this at a bank or a finance company. The loan is issued as a mortgage on your car, or some other property. The rate 10 percent for a used car up to two years old, 13 percent for one older than that

Collateral bank loan. You put up collateral such as stocks, bonds, real estate or even life-insurance policies. The security is left with the bank, though you keep any income from it. Payment is in a lump sum at the end of the loan period. Interest: five to six percent.

Signature loan. Signing on the dotted line gets you the cash, after the banker has decided that you have a steady enough job, a good credit rating and an honest face. Interest: 7½ to 12 percent.

Before you clinch the deal, take time to double-check the price your dealer asks, his trade-in allowance, and possibly his financing plan

Don't let a fast-talking salesman con you into risky financing. Beware of two well-worked gimmicks: "No-down-payment" deals, and "balloon notes."

"No down payment" means you borrow the works. You sign for a chattel mortgage, and pay up to 50 percent a year in interest. Default and you risk losing not only the car but your furniture to boot,

"Balloon note" financing works like this: The salesman lets you set the amount you want to pay each month. 'His concern for your budget will overwhelm you.) Your installments eat away at only part of the debt. The final installment is the balance: one big payment that leaves you feeling faint. You pay it in a lump sum, or else



What insurance should you have?

G SHOPPING for your insurance just as you would for a loan. A wise purchase can mean hefty savings.

A dealer or whoever backs your loan will demand some insurance on the car, as "loan protection." Usually he demands collision, fire, theft and comprehensive (flood, windstorm and the like) coverage. But it's up to you to get the other necessary insurance: property damage and liability.

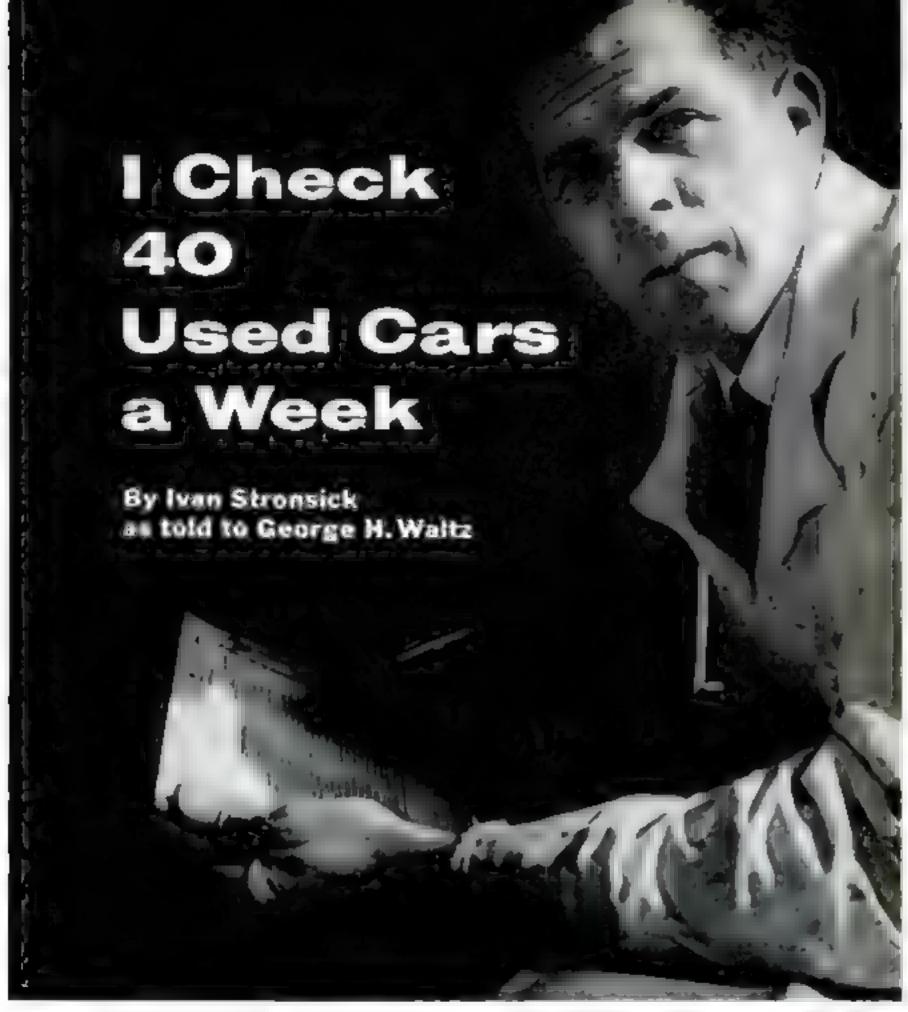
Here's where it helps to shop. A finance plan and its "loan protection" are often combined as one deal by the dealer, bank or finance company. But you can combine the "loan protection" with the other coverage you need, and buy the package cheaper through one insurance company or a broker.

Paying your premiums on a yearly

basis is usually cheapest for you. Insurance that's included with a three-year loan is a trifle cheaper than three times a one-year premium. But paying once each year you aren't stuck for the interest charges on the insurance, which is spread over the loan period. And from one year to the next, your fire, theft and comprehensive rate will fall as your car's value depreciates.

Make sure you are put into the right age group, particularly if the drivers in your family are over 25. Otherwise, your premiums can double.

If money is tight take a big deductible for your collision coverage. Premiums go down as you agree to pay more in fix-up costs. You can save almost 25 percent by taking a \$100-deductible policy instead of a \$50-deductible.



Ivan Stronsick, above, works as inspector for a company that guarantees used cars against major defects. During the war he served as a transport maintenance man in the Marine Corps, later ran his own auto-repair shop in Philadelphia

ness. In an average week I go over as many as 40, looking for trouble. My job is to take the gamble out of used-car buying. When I finally do okay a used car, you can bet, fairly safely, that it's basically sound.

I'm a trained inspector for The Car Warranty Corporation, one of several national outfits that guarantee used cars offered for sale by reputable dealers. Once a car displays my company's seal, the buyer can enjoy a year's driving without fear of being nicked for a major repair job.

I break down my inspection of every used car into three main parts. You might call them a "preliminary check," the "road test," and the "final inspection." Each is important and each can turn up troubles.

I start my preliminary check with a slow walk around the car. Generally, you can tell a good deal about a car from its outward appearance. If a car looks messy outside—dents, scrapes, rust holes—the



"Most car noises can be checked best with all car windows closed," says Stronsick, "But I also drive through an underpass—the longer the better—with the driver's window open. That way I hear noises reflected from under the car."

chances are that its innards, too, have been badly neglected. There are exceptions, but not often. If a car looks beat up

I double-check everything.

On a comparatively clean car, I look for extensive refinishing that could be the result of major repairs after a smash-up. Looking along the side of a car you can spot surface irregularities that generally mean body work. From this angle, you can also spot painted-over lettering or ue igns indicating the car was once a taxicab or a company car and is sporting a face lift.

A'ter the walk-around, I really go to work, starting at the front. First, up goes the hood, and I inspect the radiator, not only for leaks, but for water level (it should be up to the gooseneck) and for any traces of oil in the water. I inspect fan, fan belt, hoses, water pump. Then I give the entire engine a visual check,

looking particularly for oil leaks at the valve covers, fuel pump, timing-gear cover, and the crankshaft front oil seal. I look for traces of water and rust around the cylinder-head gasket (or gaskets) that might be a tip-off to cracks. If the car has power steering, I look for oil leaks or damage at the hoses and the oil reservoir. If the master brake cylinder is under the hood, I check it for fluid leaks.

When I find anything that looks like an oil or fluid leak, I carefully wipe the area clean so I can recheck that point

after my road test.

While I'm under the hood, I also check the crankcase oil level with the dip stick (if the dip stick is bent I borrow a good one). At the same time I look for any traces of water in the oil. If the car has an automatic transmission, I check its fluid level.

Getting into the driver's seat, I try



"I check front-wheel bearings by jacking up the front end, spinning the wheels one at a time and holding my hand on the front bumper or on the frame," says the inspector. "That way I can feel any bearing roughness."

the steering gear for too much play. I turn the wheel from extreme left to extreme right to detect any binding that might mean a badly worn worm or sector. Needless to say, I've already checked the front tires for any signs of uneven wear that might mean steering troubles.

My next stop is under the car. I like to get it up on a grease rack, but if I can't I just slide under. Here again, I look particularly for telltale leaks of oil, grease or fluid under the engine, transmission, clutch, universals, brake lines, the backing plates on the wheels, and rear-axle housing. As before, if I find any leaks, or what look like leaks, I wipe them clean so I can recheck them after the road test.

Out from under again, I start the motor and listen for any unusual noises or knocks. I watch the oil-pressure gauge or the oil-pressure indicator light. Pressure should build up after the first few revolutions of starting. If it doesn't, it may indicate loose crankshaft bearings or a bad oil pump.

If the car is a "stick" model, the clutch comes next. As I push the clutch pedal down with the motor running I listen for any noise that might mean a worn throwout bearing. Then I put the car in low and give it the gas slowly. If it chatters, I look for a worn clutch or defective engine mounts. I check clutch slippage by putting the car in high, setting the brakes, and giving it the gas. If she stalls, okay.

The hurdle now is the road test. For this, I try to pick a nice smooth, black-top highway that's not too busy and that has a hill or two as well as long level stretches. If you're wondering why I like a blacktop, it's because I use my ears a lot during a road test, and a concrete road is too noisy—sets up too many tire

noises. For the same reason, I won't road-test an automobile fitted with snow treads.

I generally drive the car for at least eight miles to give it a chance to warm up properly before I start listening and checking. Of course, I can't help getting some feeling about the steering, the brakes and the engine.

On a car with a regular transmission, my first check is to try it in all gear ranges, including reverse. Knocks in any range mean broken or chipped gear teeth and a whine or a howl means badly worn teeth. While I'm at it, I double-check the clutch again to make sure it's working

properly.

On a car with an automatic transmission, I check it in all speed ranges, making sure it goes through all the downshifts as well as upshifts. If it clunks loudly between shifts, that probably means trouble. I pay particular attention to how the car reacts from a standing start in the drive range. It shouldn't grab or chatter. Finally, with the brakes set and the transmission again in the drive range, I give it the gas to test for too much slippage.

If a car has overdrive, I try the cut-in and listen for any growl that might signal trouble, I also check the operation of the kickdown from overdrive and the drop-

out to free-wheeling.

While making all of these tests, I've always got my ears cocked for any clunking sounds that might mean a worn universal or any kind of bad backlash in the drive system. If I suspect anything, I let up on the gas every now and then and

listen for drive-shaft noises.

All the while, too, I'm listening for motor noises—knocks, pings and skipe and thumps and bumps that might mean suspension troubles. I'm also instinctively checking the steering for wandering, and the brakes for noises and pulling to the right or left.

I've found that most car noises can be checked best with all of the car windows closed. But I also try to drive through an underpass—the longer the better—with the driver's window open. That way I can hear noises reflected up from underneath

the car.

If the car has power steering, I pull over to the aide of the road, stop, and turn the wheels, first with the engine idling and then with the engine off. Besides making sure there's quite a difference in effort required, I also listen carefully for a slight buzzing sound that means that the pressure-relief valves are working properly when the engine is running.

Back at the lot, I put the car through its final inspection. My first job is to check out all of the possible leak points that I wiped clean during my first goround. Any new signs of grease, oil or fluid bear out my first doubts and I check further. For instance, if the back plate on a wheel shows new grease streaks, I pull the wheel to inspect the seal. In the same way, if my road test showed that the brakes had a tendency to pull, I pull the front wheels to check for possible hydraulic leaks. At the same time, I check the linings and drums.

If I have the slightest reason to suspect that the car is an oil burner—smoking exhaust, signs of blow-by from the oil breather pipe, lack of power—I run a complete compression check. The compression readings on all cylinders must be within a 15-pound range of each other.

Regardless of what the road test showed, I check the front-wheel bearings by jacking up the front end of the car, spinning the wheels one at a time and holding my hand either on the front bumper or on the frame. This enables me to feel any bearing roughness.

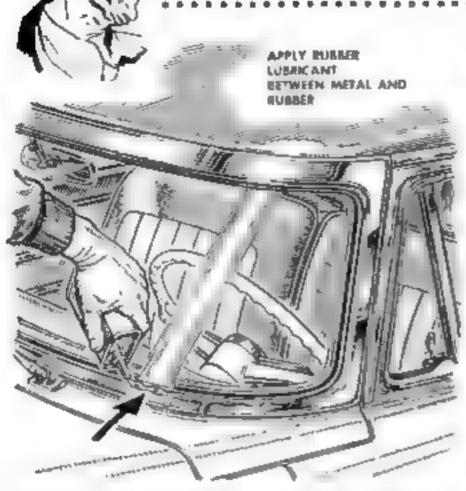
Front-end suspension I check by jacking up the front end, one side at a time, and inspecting the upper and lower control arms for wear. I test kingpin wear by grasping each wheel at the top and bottom and applying a tilting motion to

detect any play.

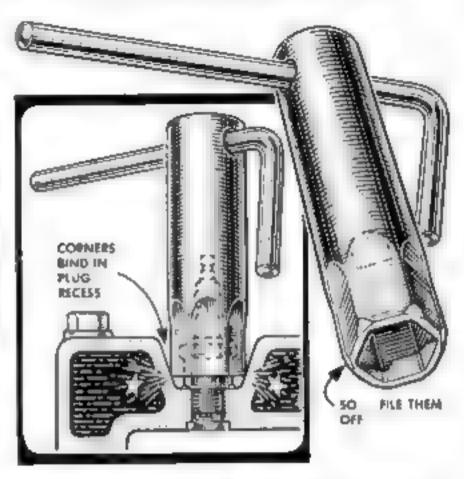
When you have looked over as many cars as I have, you develop a sort of sixth sense for locating trouble. However, sixth sense or no. I think two of the surest clues to possible trouble in the modern car, with its power-operated gadgets, are unusual noises and leaks. Both mean troubles that can cost considerable to fix. One thing sure—I won't put my okay on a used car that has either.

NEXT MONTH: Like to do your own car maintenance on weekends? June PS will tell you about four easy Saturday-morning jobs.

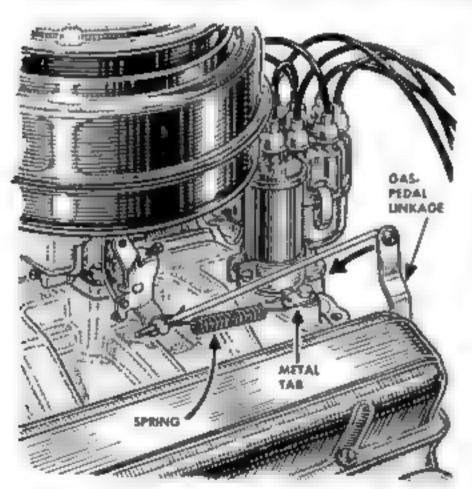
Hints from the Model Garage



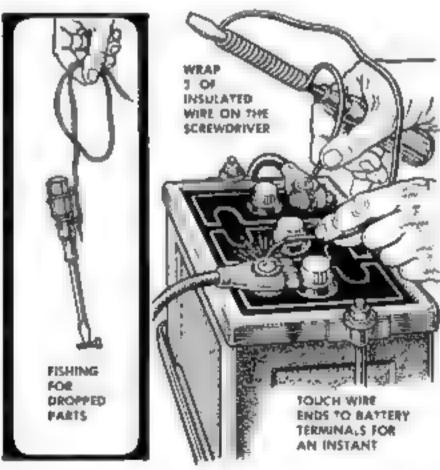
To stop an annoying squeak caused by vibration of the windshield in its opening, trickle silicone rubber lubricant between the metal molding and the rubber channel. If this doesn't silence it, force sealing compound between rubber and glass.



A spark-plug wrench will work easier if you file off the sharp outside corners. This small effort will prevent the six-sided wrench from binding or digging into the plug-recess sides as you exert pressure to loosen or tighten the plug.

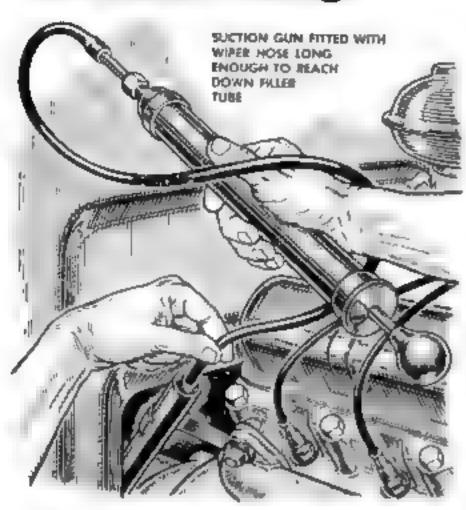


Erratic idling—fast one time, slow the next—can often be corrected by adding a 10-cent spring to the throttle linkage. Stretch the spring far enough to insure positive throttle return, and secure it to a metal tab held by a head bolt.

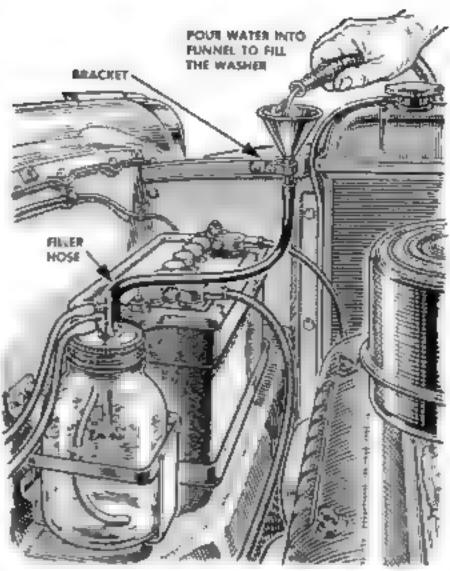


If a nut or bolt drops into an out-ofreach place, retrieve it with a magnetized screwdriver. Wrap the tool with insulated wire and briefly touch the ends to the battery. Then tie the wire to the handle and lower it to pick up the part.

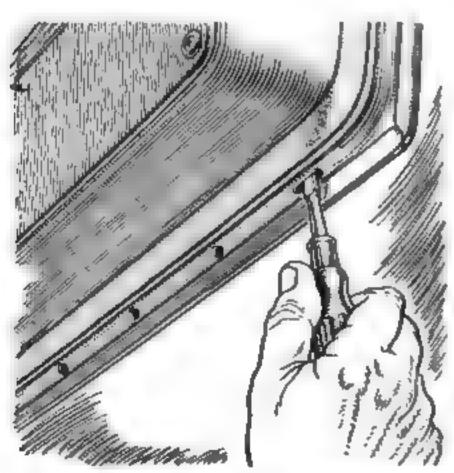
More Hints from the Model Garage



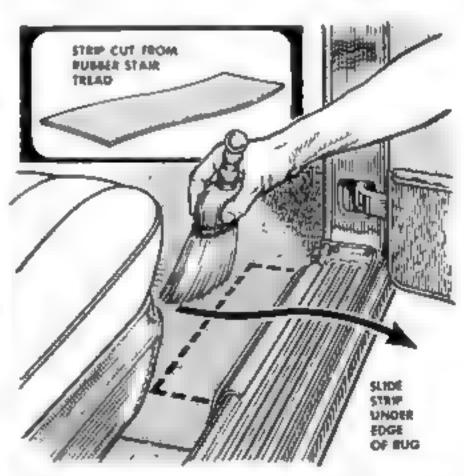
Too much fluid in an automatic transmission can be as unwise as too little. Use a suction gun fitted with a length of wiper hose to draw excess fluid up through the filler tube. Keep the gun clean and don't use it for any other purpose.



You can top off your car's windshield-washer jar every time you check the radiator, with this setup. Permanently install a small funnel on one of the radiator supports and run a length of hose from it to a hole drilled in the water-jar cap.



To prevent rusting out along door bottoms, probe the drain holes occasionally with a screwdriver. It won't hurt either, if you find them plugged, to drill additional holes. Use a 1/4" drill and space the new holes in the door between the old ones.



Bridge the gap between the floor mat and door molding to make sweeping out the car an easier job. Cut pieces of stair tread and slip them under the mat, leaving an inch or so protruding over the metal to deflect the sweepings up and out.

Favorite Short Cuts to the Junk Yard



What's your worst driving habit? What's your neighbor's? Inspectors for National Bonded Cars, Inc., were asked to list bad-driving habits that cause wear. Here are the survey leaders

Jack-rabbit starts. Wears transmission, drive shaft, rear axle, and tires.

 Unnecessary fast stops. Wears tires and brake linings. Strains front shocks.

 Riding the clutch. Wears the clutchrelease bearing and disk facing, causing slippage, which also wastes gas.

 Riding the brakes. On automatictransmission cars, using the new wide brake pedal to rest the left foot wears brake lining and overheats transmission.

Bumping front wheels against curb.
 Throws alignment out, breaks tire walls.

 Fast cornering. Wears tires, shocks and springs. Strains steering linkage. Driving too fact on rough roads.
 Damages shocks, springs, tires, transmission, frame and body alignment.

 Braking with transmission. Fine on a steep hill, but downshifting at every stop to save brakes strains an automatic transmission and wastes gas.

Spinning wheels on gravel or ice.
 Quickly runs transmission, wears rear tires, wastes gas.

• Neglecting maintenance. Low oil level causes engine friction, wears bearings. Low coolant level causes overheating, warped valves, seizing of engine parts. Low tire pressure hastens wear.



What is a Tune-Up?

Cleaning and adjusting your engine to put it in top shape could cost as much as \$40. Here's what you should know to get your money's worth

By William Carroll

OST mechanics are ready to tell you your car needs a tune-up. But few agree on what's included or how often it should be done.

It's no wonder they're confused, Plymouth's tune-up chart includes a fuel-pump test and head-bolt tightening. Chevrolet passes over both and suggests checking the coil and cooling system. The

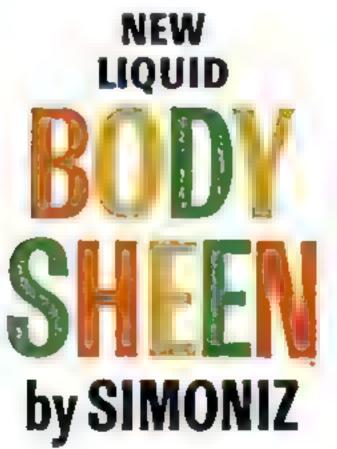
Ford factory manual recommends a vacuum gauge for adjusting carburetors, but a tachometer is the thing with Buick.

Webster defines tuning-up as "making the fine adjustments which are necessary to bring an engine into first-class running condition." But what are these fine adjustments? How do you know when they're needed?

All mechanics agree that there are two types of tune-ups: a minor tune-up, which

A TERRIFIC NEW CAR POLISH!





CLEANS & POLISHES CARS
without a wash job



New HIGH:DRY SHINE for cars

New BODYSHEEN gives car a HIGH shine, brighter than any paste wax. Thick-liquid cleaning and polishing agents leave the car dazzling.

New BODYSHEEM gives car a DRY shine. It takes off normal dirt, dust, road grime... there's no need to wash your car first.

New BODYSHEEN gives your car likenew sparkle and color. Restores original fustre to the finish. Makes faded colors glow like new. Bodysheen is ideal for all the newest car colors and finishes, too.

OIRECTIONS: Shake can well. Pour small amount of Bodysheen on cloth and wipe well on car. Let dry to a heze. Wipe off with soft cloth,

and the second second



Whether at blinding speeds in racing cars or at regular speeds in your ear, Champion spark plugs give full-firing power!

- Q. Why have 7 of the last 8 Indianapolis winners been powered by Champion spark plugs?
- A. Champions give <u>full-firing</u> power.

 Put new Champions in <u>your</u> car every
 10.000 miles. You'll get an *immediate* boost
 in horsepower...and save gasoline, too!

World's favorite spark plug-engineered for every car built by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard and every major foreign maker



is a once-over-lightly to make a good engine run better, and a major tune-up, which is a thorough testing and, when necessary, reconditioning of the engine components that affect performance. But there is not always full agreement on the

What are the steps in a tune-up?

Here are the service operations most commonly listed for each type of tune-up:

HINOR

- Clean and adjust spark plugs
- Adjust distributor points
- Reset ignition timing
- Adjust carburetor idle

MAJOR

- All items in the minor tune-up plus replacement of spark plugs and points, if necessary
- Tighten cylinder heads, manifolds and hose connections
 - Check compression in all cylinders
- Check manifold heat control and free, if necessary
- Clean air cleaner, oil filler cap and fuel-pump filter bowl
- Check engine vacuum and adjust carburetor. Clean carburetor if necessary
 - Adjust fan belt and check condition
- Check and adjust generator output and voltage regulator
 - Check coil and condenser
- Check battery condition; clean and tighten terminal connections;
 - Adjust valves (if mechanical tappets)

details of what you should get with each.

Will any engine gain from tuning? That depends. If it runs at all, a minor tune-up usually will make it run better But if compression isn't fairly equal in all cylinders (this is checked early in a major tune-up) no amount of tuning will make the engine run smoothly until the cause is corrected. Have the mechanic show you compression readings and estimate the cost before giving him the go-ahead on repairs. Adjacent cylinders reading lower than the others may be faulty because of a gasket leak between them (least expensive repair). A low reading in one cylinder usually can be traced to a burned or sticking valve (moderately expensive), but if a teaspoon of oil poured into the spark-plug hole seals the leak and brings the compression up to par, a ring job is indicated (well over \$100 on V-8 engines).

How much should it cost? Labor alone for a minor tune-up on a six-cylinder engine will cost around \$5 to \$8.50. A major tune-up on an overhead V-8 can stand you up to \$40, including the parts usually replaced. You can check the basic labor cost of any tune-up by phoning several new-car dealers for a quotation before taking the car in, but parts costs depend largely on the seller's conscience.

How often should a car be tuned? Oldsmobile specifies a tune-up each 8,000 miles or once a year, while Plymouth says 3,000, Cadillac 4,000, Chevrolet 5,000, and Ford every 6,000 miles. But no two engines wear at the same rate. That's because driving habits vary. So scheduling tune-ups by mileage alone can be wasteful. If your car seems to run okay and an \$18 tune-up adds only one mile per gallon, you'll have to drive about 15,-000 miles to pay for it with savings in gas.

A better way is to know and watch for the signs that tell you when a tune-up is about due. The signs are positive and easy to spot, either by inspecting the engine or by observing its performance. Unfortunately, engine performance slips so gradually most of us don't feel it going until it's time for a major tune-up. By that time performance is so bad almost anything will make for improvement.

Are there any "tricks" to tune-ups? Dozens. Most common is "hoiling the carburetor." At a reliable shop the carburetor is taken apart, cleaned and rebuilt

Signs that your car needs a tune-up

A 10-MINUTE inspection with only a screwdriver and a spark-plug wrench will tell you your engine's condition. Look for dirty or oil-fouled plugs; plugs with electrodes partly eaten away; points that are deeply pitted, dirty or burned; cracked or frayed ignition wires; a heavy coating of red fuel stain or gum inside the carburetor's throat; and a rough-idling engine.

Any combination of these signs indicates the need for a minor tune-up. If, in addition to the visual signs, the car performs sluggishly, stalls at traffic signals, gasps for fuel when accelerated or bucks on an uphill pull, you'd better have a major tune-up. As a general rule, every third tune-up should be a major one.



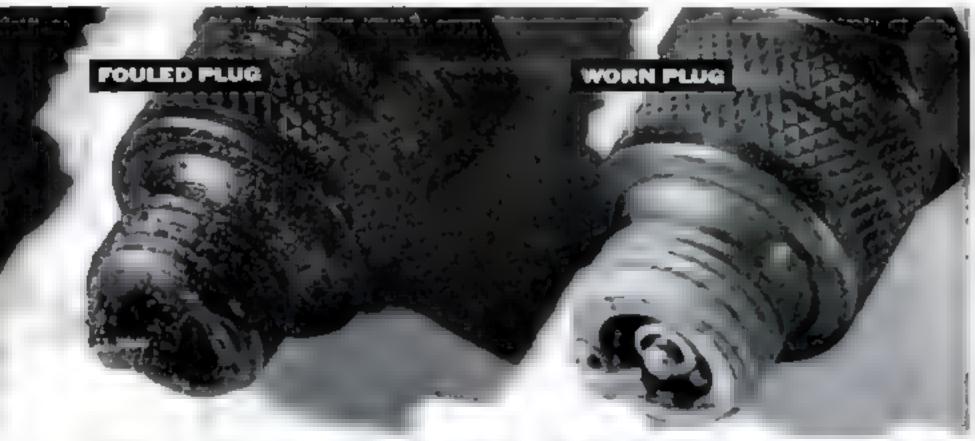
PLUGS TELL A SIG STORY. More than any other engine part, spark plugs reflect the general condition of an engine. The by-products of combustion—carbon and lead-oxide deposits—



condition of Breaker Points also tips off the need for a tune-up. If they appear sooty, or if there is black dust on the plate beneath them, they need cleaning and gapping. If their surfaces are slightly rough, they are serviceable, but probably need light cleaning and setting. A deep pit or hole on one point opposite a mound on the other (as above, at right) indicates that the points and the condenser should be replaced with a new set.

with a packaged kit of new parts, if needed. But often the whole assembly is dunked in cleaner and reinstalled with nothing more than a 12-cent manifold gasket. Few factory manuals recommend carburetor rebuilding as a routine part of

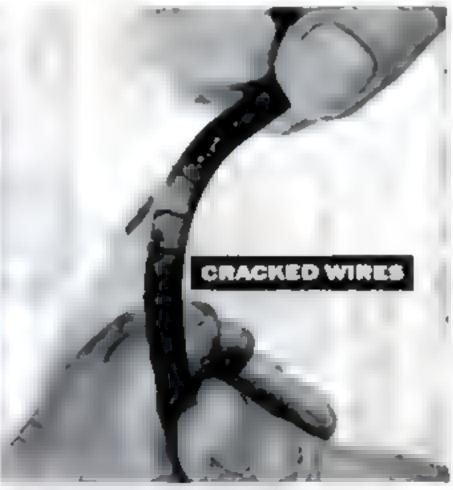
a tune-up because, as one fleet superintendent put it, "If the carburetor responds to adjustment we leave it alone, for rebuilding a functioning carburetor costs far more than the little we gain in better gas mileage."



build up on plugs over a period of use. Fouled plugs like the one in the center indicate the need for at least a minor tune-up. In time, the spark eats away the electrodes (right) making the plug difficult to gap properly. Plugs in this condition suggest the engine is overdue for a major time-up. Compare both plugs with the new, correctly gapped one in photo at left.



100K DOWN THE CARBURETOR'S THROAT and you'll say "naah!" when you find it coated with red stain and gum from the gas that's gone through it. Only a major tune-up includes cleaning the carburetor jets and passages.



HIGH-TENSION WIRES in this deteriorated condition must be replaced to make an engine perform well. Lift the hood some dark night and watch the engine idle; you'll actually see sparks leaking from cracked or oil-soaked wires.

Unnecessary replacement of breaker points, condenser and spark plugs also can pad a tune-up bill considerably. The Delco-Remy service manual states specifically, "Points which have undergone several thousand miles of operation will have a rough surface, but this should not be interpreted as meaning the points are worn out. A large contact area is maintained because roughness between the points matches so well. Such points continue to provide satisfactory service until

How they tune up Sgt. Friday's car

IN THE Los Angeles Police Department, some 750 cars travel more than 16,000,000 miles a year. Says Transportation Superintendent Ray Wynne:

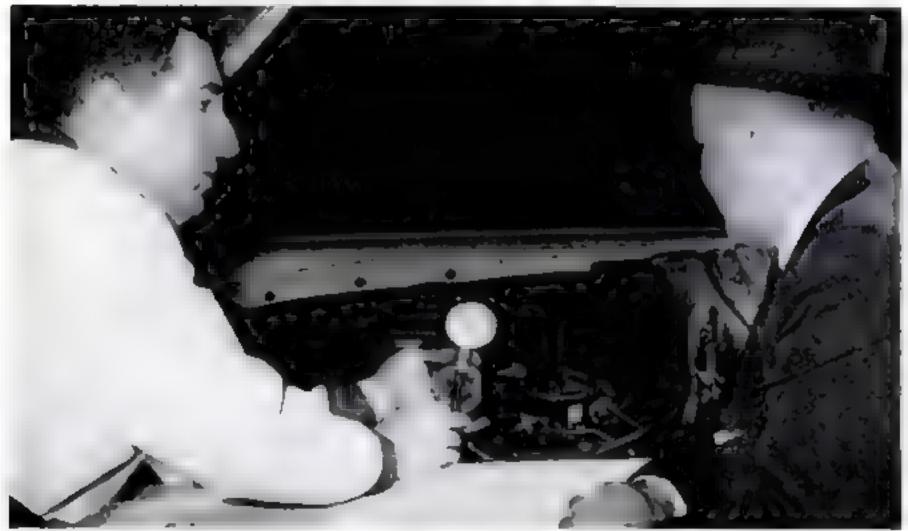
"We give each car a minor tuning every 6,000 miles, clean and gap usable spark plugs, discard those that miss at high speed and install new breaker points when we install new plugs."

most of the tungsten is worn off. However, if the points burn or have deep pits they will soon become unsatisfactory and should be replaced. But new points will provide no better service than the old, unless the cause of the burning or pitting is corrected. Rapid failure of points results from high voltage, presence of oil or dirt, improper adjustment or a defective condenser." Unfortunately, few mechanics take time to determine why points burn. It's too easy to make a noticeable immediate improvement simply by installing a new set.

The installation of rebuilt spark plugs, or reinstallation of your old ones after careful cleaning, while charging for new plugs is a common trick to watch out for.

A reputable community shop will inspect plugs and points and, if in usable condition, charge you only for the labor of cleaning and resetting them. Such a shop has a personal interest in your satisfaction that is more valuable than a few dollars saved by shopping around for the lowest price.

After the job is done, take 10 minutes for an inspection to satisfy yourself that you've actually received all the new parts that were charged on your bill. You'll have little trouble distinguishing new parts from cleaned-up old ones. Rebuilt plugs are especially easy to spot: The metal shell, normally blue-surfaced steel, is invariably painted black to conceal rust or old wrench marks.



compression check usually is the first step after the spark plugs are removed, although many mechanics will skip it when doing a minor tune-up on a late-model car. It is done by pressing a rubber-nippled compression gauge in each spark-plug hole in turn and cranking the engine an equal number of times for each cylinder tested. If one or two cylinders read more than 15 pounds lower than the others, it's a tip-off that mechanical repairs are needed.



Spring into Action!

They spark the fuel with the greatest of ease . . . that's why more new cars are equipped with ACs!

New spark plugs are an important part of any tune-up. If your spark plugs have delivered 10,000 miles or more of service, they're due for a change. A new set of Hot Tip ACs will fire up your car and go a long way toward making it act like new again. That's because AC Hot Tips burn away combustion deposits that foul plugs and reduce engine power.

They'll save you up to three times their cost, too!

ACSpark Plugs are factory-installed on more new cars than any other make. Let your AC dealer install them in your car, too!

Watch Walt Disney Studios' ZORRO every week on ASC-TV

AC SPARK PLUG A THE ELECTRONICS DIVISION OF GENERAL MOTORS

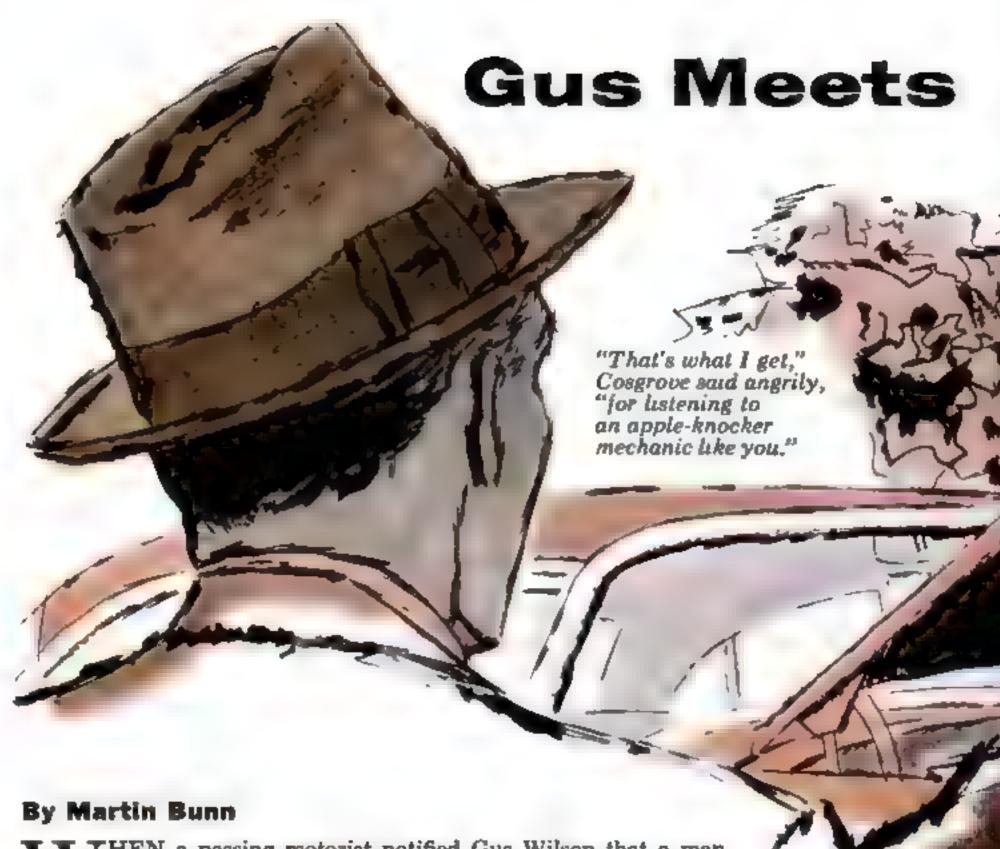


ACTION starts with



HOT TIP SPARK PLUGS

If the FUEL PUMP in your car is over three years old, replace it with a new AC . . . original equipment on most new cars.



HEN a passing motorist notified Gus Wilson that a man 10 miles down the highway needed a rental battery, the burly proprietor of the Model Garage immediately went to the rescue. Pulling up before the stalled car, Gus swung down from the cab with a 12-volt battery swinging on a carrying strap. The motorist, a youngster of about 20, greeted him cheerily.

"About time, Pop," he said, reaching for the battery. "Here, let

me take that. It's a bit on the heavy side for you."

Gus was so astonished that he relinquished his grasp on the battery "The name," he said, "is Gus Wilson. Model Garage."

"Never heard of the joint, Pop," the young fellow said as he raised the hood of his sedan, whipped a wrench and battery pliers from his pocket, and began making the battery exchange.

Gus leaned over his shoulder to glance at the date-of-sale stamp-

ings on the lead cell connectors of the car's battery.

"This battery shouldn't have failed after only a year," he said. "There must be a short in your wiring or a defective generator."

"You just leave that to me, Pop," the young man said briskly. "After my motor went dead I ran the battery down trying to start it. I knew what was wrong, of course, but hoped to get it going long enough to pull over the next rise, so that maybe I could coast down nearer a service station or telephone."

"I see," Gus said. "What is wrong?"

"Blown condenser. Any mechanic could tell that, and I've had

a Master Mechanic



four years' experience in big-time garages in the city. It would be hard to explain to the layman, but the action of the condenser is very important. If you have a blown condenser the spark is too weak to jump across the spark-plug electrodes against compression. Say, I hope the Model Garage sent out a condenser for this model car. If not, you'd better rustle your bones back to town after one. I'm due to report on the job right away"

"What job?" Gus asked

"Oh, didn't I tell you? I'm Fred Cosgrove—sent out from the city to take charge of the mechanical work for the Henderson Construction Company. They're a big outfit that's building homes in a new subdivision in the town. I'm to take care of their equipment, sort of a master mechanic's job. An outfit like Henderson's couldn't have apple-knocker mechanics fooling with their expensive machinery."

"Yeah," Gus said, as Cosgrove finished the battery exchange, "I know Matt Hen-

derson. Pretty big outfit."

"That's what I hear," Cosgrove said.
"By the way, what's your job with this Model Garage outfit, Pop?"

"Oh," Gus said, "I do just about any-

thing that comes to hand."

"I see," Cosgrove said. "Sort of handyman about the joint. Now how about a condenser for this rig?"

A FLICKER of amusement came to Gus's eyes as he said, "The Model Garage only sent a battery out with me. But I just happen to have a condenser, too. Now, where did I see it last?"

He rummaged around in the service truck and brought out a condenser.

"It's too big. You couldn't fit that thing inside my distributor with a hammer. You'd better hustle back to town and get one made for this car."

"No use in that," Gus said. "I can

tow you in as I go."

"Oh, no you won't!" Cosgrove exclaimed. "Wouldn't it look pretty for the new master mechanic for the Henderson Construction Company to be towed into town because he couldn't fix his own car on the road!"

"I never thought of that," Gus admitted. "A fellow like you does have to watch out for his reputation. Say, couldn't

you just sort of stick this condenser to the side of the distributor, or maybe hang it on the coil, and tie the wires to it? It doesn't have to be inside the distributor, does it?"

"Well now," Cosgrove said, "come to think of it, it might work that way long enough to pull me into town."

"Let's try it," Gus said.

COSGROVE managed to attach the condenser to the side of the distributor by using one of the screws that fastened the breaker plate and connected the condenser lead to the primary wire terminal. The motor started instantly and ran smoothly.

"I'd better get this battery of yours on the line," Gus said as he climbed into his service truck. "You can follow me in and have the right condenser installed. The Model Garage is on West Main Street."

"I'll find it," Cosgrove said, glancing at his watch, "I'll be stopping on the way in for lunch. I'm hungrier than a dog."

Gus drove away with a frown on his face. "Pop!" he repeated to himself. "Give me that battery, he says, it's too heavy for you, Pop!"

Gus had been at the Model Garage for about an hour when Fred Cosgrove

phoned

"Model Garage?" he said. "This is Coagrove, the man you sent that battery out to a while back. Get Pop out here again, and this time see that he brings the right condenser to fit my car. The one he brought last time went out. I had to walk a mile to a farm to telephone."

"Be right with you, Mr. Cosgrove."

Gus found young Cosgrove parked on the highway shoulder with the hood raised.

"That's what I get," he declared angrily, "for listening to an apple-knocker mechanic like you. That phony condenser blew out within two miles. I haven't got enough spark in this rig to see in a coal mine."

"No spark at all?" Gus asked. He turned the ignition on, leaned over the motor, pulled the high-tension wire from the distributor and removed the distributor cap. Holding the secondary ignition wire close to the engine block, he snapped the exposed ignition points with his thumb. Nothing happened.

"Even with a blown condenser," Gus

said, "I should see at least a weak spark, reddish instead of blue, with no snap or jump to it. I'd say you've got a bad coil, not a blown condenser."

"Is that so?" Cosgrove said. "And how do you account for the fact that my coil was all right just a couple of miles back?"

"Well," Gus said slowly, "such things do happen. Sometimes when you put a fully charged battery and a new condenser on an old coil, the coil goes blooey. Like when you put a new set of batteries in a flashlight. A light bulb that might last a "You haven't got any more spark here than a dead buzzard," he declared. "You need a new coil. I'd better tow you in."

"You aren't going to tow me anywhere," Cosgrove said. "And why haven't you got a new coil with you? What kind of a screwball outfit is this Model Garage?"

"Usually they send everything I might need," Gus said. "But you telephoned that all you needed was a condenser. Naturally, knowing that you were a master mechanic..."

"Knock it off, Pop," Cosgrove interrupted, "and get into town after a coil.

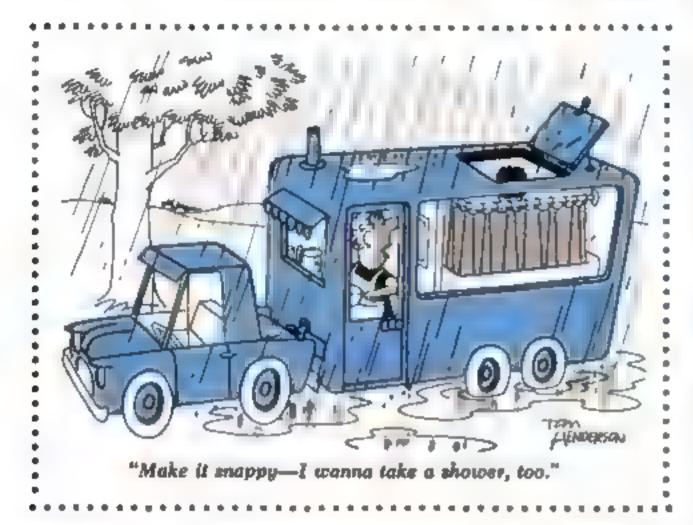
I'm in a hurry "

"Not so fast," Gua replied. "It doesn't seem to me that this coil is old enough to have gone out completely. Now, this 12volt coil of yours is basically a six-volt coil with a replaceable resistor in the bottom to cut the voltage in half. I'll bet you the best dinner in town that all that's wrong with the coil is that the resistor is burned out. Often such coils are thrown into the trash can by mechanics who don't know that they do contain an

easily replaced resistor. We could pullthe cover from the bottom of the coil,
which covers the resistor, remove it, if
it's burned out, and put the primarycircuit wires together. You'd run then,
but you'd soon burn up your ignition
points. As it is, I just happen to have a
new resistor for this coil with me."

"Just happen, eh," Cosgrove said, his eyes suddenly wise with wry humor. "Maybe I'm not as far out in the sticks as I thought. Fix it, Pop. And I hope you're not as hungry as I am, because I've got a hunch I'm buying your dinner."

"The best dinner in town, mind you."
Gus chuckled. He removed the burnedout coil resistor, installed the new one,
started the car. "You know, Cosgrove,
us apple-knocker mechanics are always
hungry."
END
NEXT MONTH: Gus eases a traffic jam.



long time with the weak batteries blows out under the load of the new"

"Flashlights aren't automobiles, Pop," Cosgrove said, "Here, give me that new condenser." Swiftly Cosgrove installed the new condenser, buckled down the hood, got into the car. "See you in town, Pop," he said as he turned on the ignition, engaged the starter. When the motor failed to start, he kept engaging the starter, a baffled expression on his face.

"Better cut that out," Gus cautioned as he raised the hood, "or you'll run the battery down. Leave the ignition on."

ONCE again Gus pulled the high-tension wire from the distributor, removed the distributor top, held the secondary wire close to the engine block, snapped the ignition points with his thumb.

10 Offbeat Uses for Soap

COAT THE SCREW THREADS of a glue container with soap and the cap won't stick fast.

PICK UP GLASS SPLINTERS by rubbing a damp bar of soap over the area where glass has broken. Then shave off the surface of the soap.

DIG YOUR FINGERNAILS into a bar of soap before you begin a painting job, working soap under the nails. Saves difficult under-the-nails cleanup after you've finished.

PLUG A LEAK in a gasoline or home fuel tank, till you can fix it, by jamming soap into the hole.

REMOVE THE BASE of a broken lamp bulb from the socket by pressing a bar of soap against the pagged edge and turning it counterclockwise. But first, be sure the current is off.

TO LIFT LINOLEUM from a tight-fitting corner use the suction of a plumber's plunger. First rub soap on the plunger edge for a tight grip.

WHEN WORKING WITH HARDWOOD, use soup to inbricate all nails and screws that you drive.

TO SOFTEN NEW ROPE, soak it in soapy water for about five minutes before you use it.

COAT BOTH SIDES OF A SAW with soap and the cutting edge will go through wood easier.

TO SAVE CLEANUP when you paint, rub a moist bar of soap over doorknobs and other hardware before you begin. Then paint spatters can be washed away afterward.

HI-FI DICTIONARY

The Popular Science Hi Fi Dictionary is published in the interest of re-establishing communications between two sectors of the American public, the hi-fi haves and the hi-fi have-nots. The rapid growth of the haves is an accepted fact of mid-20th Century life. But the newcomer who presents himself, checkbook in hand, for admission to the ranks, meets a formidable language barrier. The words sound like English. Most of them have ordinary, everyday uses. But the mysterious current of understanding that flows when insiders use them only baffles and frustrates the outsider.

The standard dictionaires have not yet met the need for adequate definitions in this rapidly growing part of the language. The vocabulary offered here is not exhaustive, but it is a key to a working knowledge. Thus equipped, the reader can step fearlessly into any hi-fi store, confident of making

himself understood.

A

a-cous'tics (ü-köös'tics), n. The branch of physics that treats of the phenomena and laws of sound, 2. The properties of an auditorium or room that add individual character to sounds heard in it. 3. A handy villain to blame any time a hi-fi system doesn't sound right,

A.F. (ā·ēf), n. Short for audio frequency. 1. A vibration at such a rate that it is audible, usually considered as ranging from 20 to 20,000 cycles per aecond. 2. An electrical voltage or current alternating at a frequency

in the same range.

A.F.C. (ā·ēf·sē), n. Short for automatic frequency control; an electronic circuit in an F.M. tuner used to make tuning simpler and to compensate for any tendency of the receiver to drift off-tune.

A.M. (ā·ēm), n. Short for amplitude modulation; the form of transmission used on standard broadcast radio, such as that picked up by the ordinary kitchen set.

amp. (amp), n. 1. Short for amphilier; used in compounds, such as pre-amp for pre-amplifier (q.v.) or power-amp (see basic amplifier). 2. Short for am'pere (am'per), a unit used for measuring electrical current.

au'di-o (aw'dē-ō), n. 1. The electrical voltages and/or currents that, after amplification, will cause a loudspeaker to deliver sound. 2. Syn. for "sound" in audiophile vocabulary.

au'di-o-phile' (aw'dē-ō-fīl'), n. A person to whom listening to hi-fi is a way of life.

\mathbf{R}

back'loaded horn (băk'lôded hawm), n. A loudspeaker enclosure arranged so the sound from the front of the cone feeds directly into the room, while the sound from the rear feeds into the room via a folded horn.

baf'fle (baf'ful), a. Any structure for holding a loudspeaker that prevents low-frequency sounds produced by the back of the speaker cone from canceling those produced by the front of the cone. ba'sic am'pli-fi-er (bā'sik ām'pli-fi-ūr), n. An electronic unit that takes audio input from a tuner or pre-amplifier and provides power to drive the loudspeaker. Also called power amplifier, Low-pow'er a.: (up to 12 watts) sufficient to produce loud sound in owner's living room, High-pow'er a.: (25 watts and up) sufficient to produce loud sound in living room a block away.

bass (bas), n. 1. Musical tones corresponding with a rate of vibration lower than 260 per second (played in the bass clef). 2. Audio in the frequency range delivered by the

crossover (q.v.) to the woofer (q.v.),

bass re'flex (bas re'flex), n. 1. A loudspeaker enclosure in
which radiation from
the rear of the cone
is allowed to escape
through a hole (or
port) in such a way as
to augment the lowest tones, Also called



port'ed re'flex or vent'ed re'flex. 2. A peremptory challenge to an advocate of horn-

type enclosures.

bi'as (bi'us), n. 1. An operating voltage (for tubes) or current (for transistors) that fixes the correct performance characteristics. 2. An affliction suffered by most audiophiles that colors their opinion of components other than the ones they use.

bin-au'ral (bin-aw'rul), adj. Pertaining to equipment or sound that makes use of the human faculty of hearing independently

with each ear.

boom (boom), v., n. Accentuation of one of the bass tones, by resonance (q.v.).

C

ca-pac'i-tor (kă-păs'i-tūr), n. An electronic part that permuts audio or other AC currents to flow through it while blocking current from DC operating voltages.

car'tridge (kar'trij), n. See pickup.

cath'ode (kāth'ōd), n. The part of a tube

that provides electrons, usually by being heated

cath'ode fol'-low-er out'put (fol'lô-ùr out'put), n. A circuit feature used mainly in pre-amplifiers and tuners to avoid loss of high frequencies and minimize hum pickup in the connecting cable to the power amplifier.

ce-ram'ic pick'up (sĕh-rām'ik pik'ŭp), n. A pickup (q.v.) using a synthetic piezoelectric (q.v.) element which is resistant to high temperatures and humidity.

chas'sis (shăs'ē), n. The metal frame on which any piece of electronic equipment (amplifier, pre-amplifier, tuner, etc.,) is built.

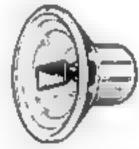
class A (klas a), adj. A mode of operating an amplifier stage that gives the best linear (q.v.) quality and reliability.

class AB (-ā-bē), adj. A mode of operating midway between class A and class B.

class B, adj. A mode of operating two tubes or transistors in push-pull that gives the best efficiency (biggest maximum-output potential), usually at some sacrifice of linearity and/or reliability.

clip'ping (klip'ping), n. A distortion that occurs, mostly in basic amplifiers, when maximum output is reached.

co-ax'i-ai speak'er (kō-āx'ē-ūl spēk'ūr), n. A unitary (q.v.) type in which a woofer and tweeter are mounted together so the sound emerges at the same point, whatever its frequency.



Conxual Speaker

com'pen-sa'tion (kôm'pēn-sā'shūn), a. Specrfically pickup c. (see equalization) or loudness c. (see loudness control).

com-pliance (kom-plians), n. 1 A meassure of the ease with which a part needing to move at audio frequencies can do so; opposite of stiffness. Applied to (1) pickup stylus and (2) loudspeaker surround. 2. Lowsales resistance.

cross'o-ver (kraws'ō-văr), n. An electrical or electronic circuit that delivers the various audio frequencies to the proper speakers in a two-way or three-way system.

crys'tal pick'up (kris'tul pik'up), n. One using a natural crystal (usually Rochelle sait) for the piezoelectric (q.v.) element.

cy'cles (sī'kūls), n. Contraction from cycles per second; a measure of frequency of electrical impulses or of sound vibration rate.

D

damp'ing fac'tor (damp'ing fak'tur), a. A measure of an amplifier's effectiveness in preventing a loudspeaker from oscillating on its own when the audio drive terminates, figured by dividing the nominal loudspeaker impedance by the measured amplifier-output impedance.

dec'i-bel (des'i-bel), n. Abbr. db. (dee-bee). A unit for measuring the relative intensity of sound. It is one-tenth of a bel, the fundamental division of a scale for expressing the ratio of two amounts of power.

de-em'phasis (dē-ēm'fū-sīs), n. A process applied in receiving F.M. or playing records, to remove the pre-emphasis (q.v.) applied

in transmission or recording,

dis-crim'i-na-tor (dis-krim'i-nā-tūr), n. One type of detector for extracting the audio from a frequency-modulated transmission (see F M.).

Dop'pler of fect' (döp'plür ef fekt'), n. The change in pitch of a sound due to relative motion of source and listener. Theoretically it occurs in loudspeakers when a low-frequency and a high-frequency sound are being reproduced simultaneously. The low-frequency movement will raise the higher frequency when the cone moves forward and lower it when the cone returns. The practical effect is very small.

dy-nam'ic mass (di-năm'ik mās), n. The effective weight, or mass, of a moving part. Applied to the stylus assembly of pickups, the tone arm, and the moving parts of loud-

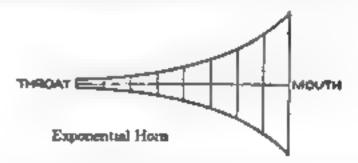
speakers.

dy-nam'ic range (-rānj), n. The coverage, in decibels, between the loudest and softest audio a system, record or tape will handle (see signal-to-noise ratio).

E

e-lec'tro-stat'ic tweet'er (ē-lēk'trō-stăt'īk twēter), n. A variety of tweeter using a large flat disphragm that is driven directly by a varying high voltage applied between the disphragm and another electrode.

e-qual-i-za'tion (ē-kwūl-i-zā'shūn), n. 1. The use in a sound-reproduction system of a circuit having a frequency response (q v,) tailored to equalize or compensate for a recording characteristic (q v.) used in making a disc or tape. 2. The process by which the relative intensities of the high and low frequencies are restored to their original relationship in playing back a record or tape.

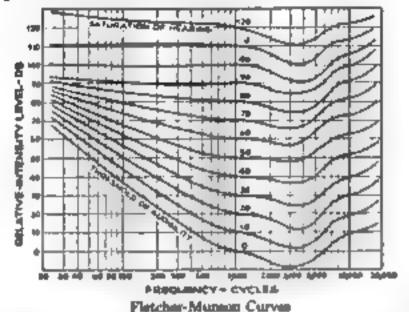


ex-po-nen'tial horn (ex-po-nen'shul hawrn), n. A horn whose shape is determined by a particular mathematical (exponential) equation. It is generally regarded as giving the flattest frequency response with the least distortion when properly designed and constructed.

F

fil'ter (fil'tur), a. An electrical or electronic

device that permits certain frequencies to pass while obstructing others.



Flet'cher-Mun'son curves (flet'chur-mun'sun kurva), n. The original loudness-contour curves. They show the average sound intensity needed to produce different loudness sensations among a number of listeners, over the audio-frequency range.

flut'ter (flut'tur), n. 1. A rapid fluctuation in speed, either in tape transit or record rotation. 2. The rapid pitch fluctuation produced thereby in the reproduced program.

flux den'si-ty (flux den'si-te), n. Intensity of magnetization, either alternating (audio) or permanent (magnet).

FM (Af. Sm) = Short for

F.M. (ef-em), n. Short for frequency modulation. The kind of transmission that is immune to static and achieves the highest possible fidelity in radio transmission.

fre'quen-cy re-sponse' (fre'kwen-se response'), n. A curve indicating the relative response of a system, or part, to the different audio frequencies. Said to be flat when response is uniform to all frequencies.

G

gain con-trol' (gan kûn-trôl'), n. A control for adjusting the amplification of a system. Sometimes called level or volume control (q.v.).

groove (groov), n. An indented track in a phonograph record that transmuts audio vibrations to the pickup stylus.

и

har-mon'ic dis-tor'tion (har-mon'ik distawr'shun), n. A form of distortion, produced by any part of a hi-fi system, that results in overtones (q v.) of improper audio frequencies. Also called non-lin'e-ar dis-tor'-tion.

hiss (his), n. A sound like escaping steam that can be due to a variety of causes (see noise).

horn cut'off fre'quen-cy (hawrn cut'awf fre'kwen-se), n. A frequency below which a horn will not function correctly, because it fails to provide for proper expansion of the sound waves (see exponential horn).

hum (hum), n. 1. A low-pitched sound due to the AC power-line frequency—or some byproduct of it—getting into the audio. 2. A handy signal that the set is turned on, if the hum defies all repair efforts.

hys'ter-e'sis syn'chro-nous mo'tor (his'-ter-e'sis sin'krō-nūs mō'tūr), n. A kind of electric motor used for driving turntables, having the ment that its constancy of speed is fixed by the supply (line) frequency.

T

im-pe'dance (im-pē'dūns), n. A quantity analogous to resistance (also measured numerically in ohms), that determines the relationship between voltage and current in an audio circuit. High im-pe'dance, adj.: Applied to a circuit where the audio voltages cause negligible (if any) audio current to flow. Low im-pe'dance, adj.: Applied to a circuit where measurable audio current accompanies an audio voltage (the impedance in ohms determining the relationship).

im-pe'dance match'ing (-māch'ing), n. The combining of circuits in which impedance

values satisfactorily correspond.

in'fi-nite baf'fle (in'fi-nit băf'ful), n. 1. Hypothetically, an infinitely large board with
a hole in it, in which a loudspeaker is
mounted. 2. A totally sealed enclosure, except for the hole to receive the loudspeaker.

in'ter-mod'u-la'tion dis-tor'tion (in'turmod'ul-la'shun dis-tawr'shun), n. Any of a variety of distortions that occur from interaction among the different frequencies in

un audio program.

L

lab'y-rinth (lab'i'rinth), n. A type of speaker enclosure in which a folded passage, coupled to the back of the speaker cone, is designed to improve the bass performance of the speaker.

lev'el con-trol' (lev'ül kün-trol'), n. A control intended mainly to ensure that each part of a system works at its best, by careful initial adjustment; not intended to con-

trol volume (see volume control).

lin'e-ar (lin'ê-ur), adj. 1. Characterized by absence of harmonic or intermodulation distortion (q.v.). 2. Characterized by having a flat frequency response (see frequency response). 3. Characterized by amplifying a "quiet" program in uniform proportion with a louder program.

loud'ness con-trol' (lowd'nes kun-trol'), n.

1. A control that automatically boosts the bass when the program is played at low volume. This is supposed to restore a natural balance to the sound that is lost because the ear is less sensitive to low frequencies when volume is low. 2. An unsympathetic spouse.

ioud'speak er ef fi'cien cy (lowd'spek ur ef fish'un-se), n. An approximate indication of the audio power a loudspeaker requires

to give adequate sound output.

loud'speak-er en-clos'ure (-ën-klōs'yūr), n. The cabinet housing a loudspeaker, part of its function being to contribute to speaker performance,

loud'speak-er sys'tem (-sis'tem), n. A complete speaker assembly, consisting of a number of loudspeaker units mounted in their enclosure.

M

mag-net'ic pick'up (măg-nēt'īk pīk'ūp), n. A form of phonograph pickup that uses the stylus movement to change the magnetic field around a fixed coil and thus produce audio voltages.

mi'cro-groove (mi'krô-groov), n. Name given to any disc record with a groove designed for playing with a 1-mil stylus having a radius at its "point" of .001".

mo'tor-boat'ing (mô'tùr-bôt'ing), n. Spurious audio generated internally by maltunctioning of an amplifier and characterized by a plop-plop sound from the loudspeaker

mouth (mowth), n. 1. The large end of a horn, which delivers sound into the room.

2. A source of distraction accompanying non-hi-fl visitors.

mov'ing coil (moov'ing koil), adj. or n. 1. Applied to a pickup where the stylus moves a minute coil in a magnetic field, producing audio voltage. 2. Applied to a loudspeaker where the audio is fed to a coil free to move and drive the cone.

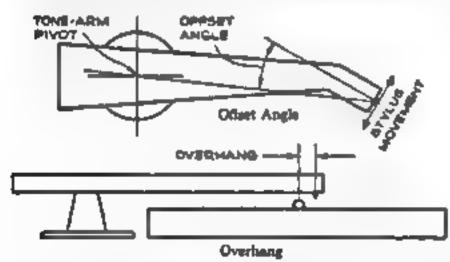
N

neg'a-tive feed'back (neg'ú-tiv (ed'bak), n. An electronic process of sampling the audio output, comparing it with the input, and using the result to improve the performance of the system.

noise (noiz), n. Any form of unwanted audio or sound not related to the program content.

0

off'set an'gle (awf'set an'gul), n. The angle between the axis of the pickup and an imaginary line from stylus to tone-arm pivot.



o'ver-hang (ō'vūr-hăng), n. The critical dimension by which the stylus overreaches the center spindle of a turntable when an offset tone arm is mounted for minimum tracking error (q.v.).

o'ver-tone (ö-vür-tön), n. 1. (mus.) A frequency that approximates an integral multiple of the one responsible for the pitch played, and which contributes to the timbre

of the instrument. 2. (audio) An exact frequency multiple, either generated deliberately, as in an electronic organ, or in error, as in harmonic distortion (q.v.)

P

pack'aged sys'tem (păk'ŭjd sis'tem), n. 1. A complete record-playing assembly that comes in one box, called "a hi-fi." 2. A dirty word to the hobbyist who uses "components."

phase in-vert'er (fåz In-vürt'ür), n. An electronic circuit that provides two audio voltages in opposite phase, so that one goes positive when the other goes negative; required in any push-pull (q.v.), amplifier.

pho'no-graph (fō'nō-grāf), n. A. primitive machine for playing records, used in the days before merchants discovered the sales advantages of a "hi-fi" label.

pick'up (pik'up), n. A device, the modern counterpart of the sound-box, that transcribes the undulations of a record groove into electrical waves, for amphification before being converted into sound by the loud-speaker.

pi-e'zo-e-lec'tric (pi-è'zō-è-lèk'trik), adj. Utilizing substances in which twisting or bending of the material by the stylus motion produces an electrical output.

pitch (pich), n. The combination of frequency and intensity in a sound, judged by the average musically trained ear, that determines its position on a musical scale.

plat'ter (plat'tur), n. Familiar name for a phonograph record, disc type.

port (pawrt), n. A carefully dimensioned and positioned hole, used in a bass-reflex (q.v.) enclosure. Also called a vent.

pre-am'pli-fi-er (pre-ăm'pli-fi-ur), n. Abbr. pre-amp. An amplifier not designed to deliver power output, but to receive the very small inputs from pickups and/or tape heads, provide equalization, tone control, volume and/or loudness control, and produce output sufficient for the input of a basic amplifier (q.v.). Also given the sophisticated name of au'di-o-con-trol' cen'ter.

pre-em'pha-sis (pre-em'fu-sis), n. A process used, in transmitting F M, or making records, to increase the relative intensity of higher frequencies for better signal-to-noise ratio (q.v.). (See also de-emphasis.)

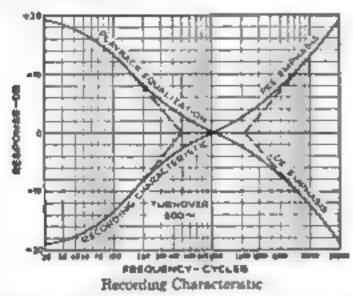
pres'ence (prez'ens), n. 1. An impression, due to the degree of realism, that the original program source (e.g. an orchestra) is in the room. 2. An additional slight boost given to frequencies in the range from 3,000 to 5,000 cycles, alleged to enhance the effect.

push-pull (push-pul), n., adj. A method of operating tubes and transistors in amplifiers, so that the current in one, due to the audio, increases while the other decreases; and vice versa—the purpose being to improve performance and efficiency of the amplifier's output stage.

R

ra'ti-o de-tec'tor (rā'shē-ō dē-tēk'tūr), n One type of detector for extracting the audio from an F.M. transmission (see F.M.). rec'ord chang'er (rek'awrd chânj'ur), n. 1.

A machine designed to play a number of phonograph records automatically, 2. A music-store customer who's dissatisfied with his latest purchase.



re-cord'ing char'ac-ter-is'tic (rå-kawrd'ing kār-āk-tūr-īs'tīk), n. The overall frequency response used for making a record, consisting of de-emphasis below turnover {q.v.} and pre-emphasis (q v), (See also equalization.)

rec'tl-fi'er (rek'ti-fi'ur), n. An essential part of the power supply of any system powered by 60-cycle line; it converts AC into the DC required for operating the equipment.

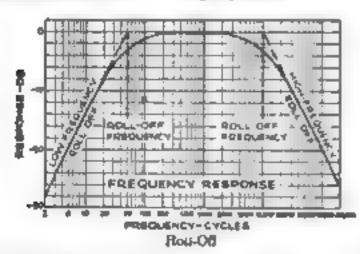
res'o-nance (réz'ō-nuns), n. A tendency of mechanical parts, e.g. pickup stylus, tone arm, loudapeaker cone, enclosure panel, to vibrate at one particular frequency, causing undestrable overemphasis of that frequency when it occurs in the program.

re-ver'ber-a'tion (ru-ver'ber-a'shun), n. Reflected sound that follows the original so closely that it is not heard as a separate entity, but seems to reinforce it.

RIAA curve (ahr-î-ă-ă kurv), n. Short for Recording Industry Association of America

curve; the standard recording characteristic (q.v.) in this and most other countries for microgroove records; or the corresponding

equalization curve for playback.



roll-off (roll-awf), n. 1. A progressive reduction in amphification or reproduction of frequencies, extending either upward or downward from a particular frequency, 2. The frequency at which reduction begins.

rum'ble (rum'bul), n. A spurious low-frequency sound caused by vibration of the turntable motor or associated machinery, made audible by being transmitted mechanically to the pickup.

S

se-lec-tiv'i-ty (sű-léc-tiv'ű-té), n. A messure of the ability of a radio tuner to separate radio transmissions on adjacent channels.

sen-si-tiv'i-ty (sēn-sī-tīv'ī-tē), n. A measure of the minimum signal a piece of equipment, such as a tuner or pre-amplifier, will satisfactorily handle, from an antenna or pickup.

sig'nal-to-noise ra'tio (sīg'nŭl-tōō-noiz rā'shē-ō), n. A measure, in decihels, of the difference between the loudest audio and the background noise of a system or record.

squawk'et (skwawk'ür), n. A name preferred in some circles for the mid-range speaker unit of a three-way system.

stat'ic (stăt'ik), n. 1. Radio interference that causes a sputtery sound, especially that, called man-made static, due to electrical machinery. 2. With modern vinylite-disc records, an electrical surface charge that attracts dust

ster'e.e.phon'ic sound (atër'ë-ö-fon'ik sownd), n. Sound produced by two or more loudspeakers, each using a recording of the same program made independently from separate microphones, the object being greater realism.

strob'o-scope (ströb'ō-skōp), л. A disc with uniform radial black and white markings to be applied to turntables for checking speed. When viewed under alternating-current light of the correct frequency (usually 80 c/s) the pattern appears to stand still when rotation is at the correct speed.

sty'lus (sti'lus), n. 1. The modern counterpart of the old phonograph needle, consisting of a sapphire or (preferably) diamond tip precisely shaped to conform to the groove contour, persistently called needle by the uninitiated. 2. The needle in a \$20 phono-

graph, if you want to talk hi-fi,

sty'lus force (-fawrs), n. The downward force exerted on the stylus to keep it in the groove.

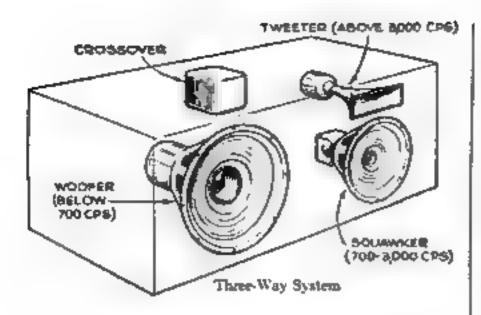
surface noise (surfis noiz), n. A form of unwanted sound, due to irregularity in the groove surface of a disc; or, in a tape, to irregularity in the magnetic material

sur-round' (sur-round'), n The part of a loudspeaker cone by which its outside edge is anchored, usually corrugated.

 ${f T}$

tape re-cord'er (täp rü-kawrd'ür), n. A machine for making records on magnetic tape and usually also for playing them back.

throat (throt), n. The narrow part of a horn next to the loudspeaker diaphragm or cone.



three-way sys'tem (thre-wa sis'tum), n. A loudspeaker system using three units: a woofer to handle the lowest frequencies, a mid-range unit (squawker) for the mid-frequencies), and a tweeter for the high frequencies.

tone arm (ton arm), n. Originally the tube used to convey the sound (or tone) from the sound box to the horn of the phonograph, whence, in modern systems, the arm that holds the pickup cartridge and ensures that the stylus is correctly aligned with the groove.

tone con-trol' (-kun-trol'), n. One or two controls for adjusting the balance of frequencies in the program to the listener's taste.

tracing dis-torition (trasing dis-tawrshun), n. A form of distortion in record playback due to the difference in shape between the recording and reproducing styli.

track'ing er'ror (trak'ing er'rur), a. Deviation from the ideal in the alignment of the atylus with the groove—inherent in the use of a pivoted tone arm; the angular measurement between the axis of the pickup and a line tangent to the groove being played.

trans-duc'er (trans-doos'ur), n. Any device for converting energy from one form to another - acoustic, mechanical or electrical hence a general name including pickups, recording heads, microphones, loudspeakers, etc.

tran'sient (trăn'shent), n. adj. 1. (mus.)
The initial part of any tone played by an instrument or instruments. 2. (audio) Any abrupt or nonrepetitive waveform

tran'sient dis-tor'tion: n. 1. Failure to amplify any transient correctly. 2. A name often given to any unaccountable sound in the reproduction.

tran-sis'tor (tran-zis'tür), n. A modern refinement of the crystal and cat-whisker that produces amplification, and, for some applications, can supersede tubes.

tre'ble (tre'bul), n. 1. Musical tones corresponding with a rate of vibration greater than 260 per second (played in the treble clef). 2. Audio in the range of frequency delivered by the crossover to the tweeter of a two-way system. 3. Unspecified higher frequencies,

tube (toob), n. An envelope, usually of glass, evacuated to enable free passage of electrons, and containing essentially: a heated cathode to emit electrons, one or more grids to control their flow, and a plate to receive them. Sometimes two or more assemblies are contained in one envelope; in these cases the word tube may be applied either to each assembly or to the entire envelope.

tun'er (tōōn'ŭr), n. A special radio receiver, giving an output suitable for feeding to a basic amplifier, not to a loudspeaker.

turn'o-ver (turn'o-vur), n. In making records, the frequency below which a progressive reduction in level is applied to achieve a particular recording characteristic (q v.); in playback, the point at which the corresponding boost takes place (at 500 c/s in the RIAA curve).

turn'ta-ble (turn'ta-bul), n. The revolving table on which a disc record is placed for playing.

that handles the highest frequencies.

IJ

u'ni-ta'ry (yū'nī-tē'rē), adj. Applied to types of loudspeaker in which two or more loudspeaker units are built into a single assembly, as in coaxial construction.

V

valve (válv), n. Same as tube (Br.).

va'ri-a-ble damp'ing (va'rē-ŭ-bùl dămp'ing), n. An adjustable feature in a basic amphifier that makes it possible to vary the output impedance to the loudspeaker, thus changing its damping factor (q v.).

vent (vent), n. See port.

vi'nyl-ite (vi'nil-it), a. The material of which modern microgroove records are pressed, molded or fused; hence, a familiar name for these discs, which are also known as vinylite biscuits.

voice coil (vois koil), n. The delicate coil in a loudspeaker unit, through which audio current flows to produce the force on the cone or disphragm that in turn produces the sound

vol'ume con-trol' (vŏl'yūm kūn-trōl'), n. A gain control (q.v.) intended for adjustment of volume of sound, but without loudness compensation (see loudness control).

W

woof'er (woof'ūr), n. A loudspeaker unit built specifically to handle the lowest audio frequencies.

wow (wow), n. 1. A slow (about twice-persecond) fluctuation in the speed of a turntable, or the equivalent in tape drive, that causes a corresponding fluctuating pitch in program reproduction. 2. The effect it has on reproduction.



Why Yell? This Kid-Calling System Rings the Bell

Our neighborhood has solved the problem of calling our children. Each household has a bell—one a coach bell, one a large bell mounted on a post, and several have hand bells. My family uses an electric bell, mounted outside with a button in the kitchen. Each child has an individual call of a certain number of rings. Six rings means "everybody come."—
Richard Callagar, Maryville, Tenn.

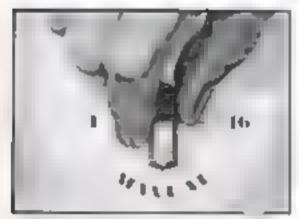
How to Avoid Splits in Wood Wheels for Toys

Will the wooden wheels you make for junior's car split across the grain? They won't if, before you saw them out, you glue two or more dowels, as reinforcement, into holes drilled through the blanks across the grain.—Frank A. Javor, Newark, N. J.





TITES TO THE CONT



sless as preset intervals -4, 8, or 16 seconds Splitsecond changes at any speed



Remote-control to conclusion to a facilities process of control show it you at a stage guests. Cording to d



Semi-automatic concessions at the same backward or ferward order to the time.

EASTMAN KODAK COMPANY,

New Kodak Cavalcade Projector changes slides by itself!

You turn it on . . . it does the rest!

IMAGINE! A color slide projector that lets you relax and enjoy the show without touching a button... that will project your slides perfectly even if you leave the room.

The new Kodak Cavalcade Projector combines all the features you have ever wanted for the easiest, smoothest slide shows ever!

For automatic operation, you simply set the timer for the interval you want. Turn on, focus the first slide, and your Cavalcade Projector does the rest.

There are 3 ways to enjoy semi-automatic changing, too. For remote control, a remote cord is included. By push-button, at rear of the projector. Or you can use the control wheel at the side.

Your slides stay in constant focus, because all slides are preconditioned with a stream of air before projection. Never any focusshift no matter how many slides you show!

The Cavalcade is the only projector that lets you "edit" your slides while they're in the projector! You can remove one slide, replace it with another without removing the slide

tray. There's a built-in screen pointer, too.

When you place the slide tray into the projector, you insert it right side up. Your slides can't spill out.

Choice of slide trays: (1) Takes 40 cardboard slides. (2) Takes 30 glass, metal, plastic slides. U-shaped steel guards protect all slides.

A hi-loswitch on the Cavalcade Projector lets you project with either 300 or 500 watts, according to your needs. For "super slides" a supplementary condenser is available for extra-bright showings.

The Cavalcade Projector has an f/2.8 lens and a built-in preview screen. Ask your photo dealer to demonstrate the compact new Cavalcade Projector. It has been precision-designed by Kodak to deliver years of wonderful color slide enjoyment.

Price, including 12-foot remote control cord, \$149.50, or \$14.95 down. Price is list, includes Federal Tax, and is subject to change without notice.



Constant focus — No "pop."
A special stream of air preconditions every slide—prevents focus-shift during show.



New Kodak 500 Projector is as easy to carry as a portable radio, shows color slides big and bright. Kodak 500 Projector, \$74.50. Also—Kodak 300 Projector, \$64.50.



Kodak

Rochester 4, N. Y.



Charcoal Lighter for Your Barbecue

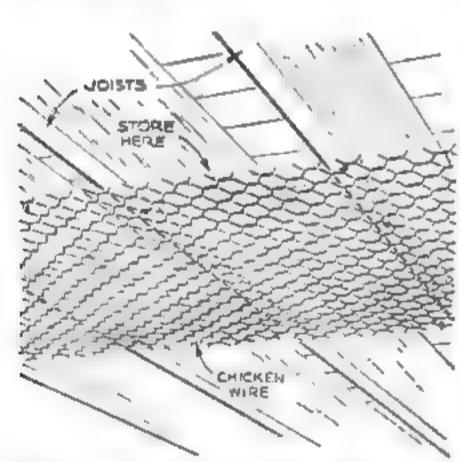
HERE'S how I get a fire going fast for a barbecue. I start the charcoal burning in an old gallon can punched through at sides and bottom with a beer-can opener. On the bottom of the can I lay a small wad of newspaper. Over this goes a layer of light kindling topped with a dozen or so pieces of charcoal.

Then I light the paper through the holes in the bottom. Once the kindling catches fire, I pile on more charcoal and hang the can from the children's swing support with a long rope. It sways gently



without attention, its contents fanned by air entering the perforated sides. In 15 minutes, the canned fire is burning well enough to be dumped into the brazier.—

I. H. Smith, Williston Park, Ill.



Storage idea for the Cellar

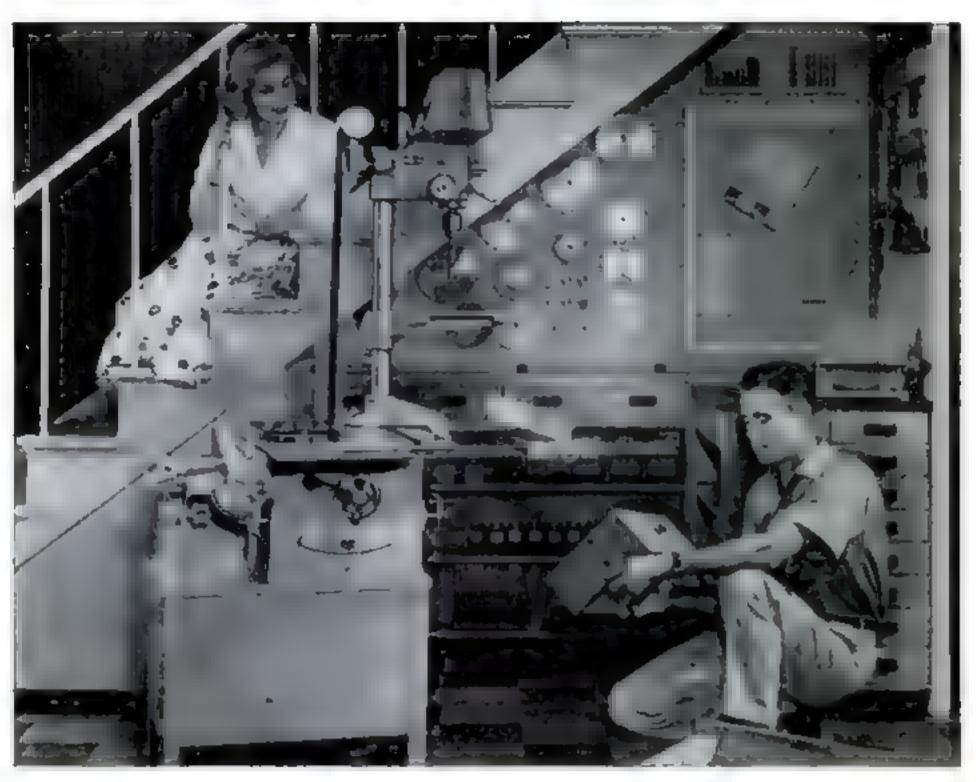
For inexpensive and effective storage in an unfinished basement, take a length of 1"-mesh chicken wire about 2' wide and staple it across the ceiling joists. Place it far enough from the wall or other obstructions to permit access from either eide. If cans and bottles are stored with the labels downward, you can read them without removing them from the wire shelf.—H. E. Loigren, Sussex, Wis.



Fitting Eases Grease Job

ONE skipper I know has installed pressure grease fittings in the wheels of his boat trailer to make sure the bearings will always have grease. There's no need to pull the wheels to repack the bearings. After each trip, he simply gives each wheel a couple of shots. This is good maintenance for wheels that go into the water when the boat is launched or loaded.

—L. H. Schrimpi, Tulsa, Okla.



BIG IDEA FOR SMALL SPACE

New Advanced Design DE

DELTA'SHOP

Combination of 4 full size tools does 95% of all workshop jobs—yet takes space only 3 feet square!

If you want a real shop, but don't have a lot of space, the DELTASHOP is for you. It's the most practical all-purpose combination tool built!

Here's why: In a space just 3 feet square it puts at your finger tips a powerful 9" tilting arbor circular saw, a 4" jointer, an 11" drill press, and an 8%" disk sander—all mounted on one stand and powered by one motor. And because Delta-Shop is a combination of full size tools (not attachments) you can buy it all at once (as little as 10% down), or the easy Tool-At-A-Time way.

IT'S SO EASY TO OWN THE BEST!

Because Delta makes the world's most complete line of combination, all-purpose and individual power tools, you can choose tools exactly right for you. And you'll have the "newest look" in the world's finest power tools.

BUILD THIS SPACE-SAVER SHOP

Delta experts designed this shop so that you can build it. Easy-to-follow plans and the New Delta Reference Guide are yours—FREE—just send a post card with your name and address to: Delta Power Tool Division, Rockwell Mfg. Co., 504B N. Lexington Ave., Pittsburgh 8, Pa.

Do it <u>now</u>—then see <u>all</u> the New Advanced Design Delta Tools at your Delta Dealer. (He's listed under "TOOLS" in the Yellow Pages.) Or at leading Department, Hardware, and Building Supply Stores.

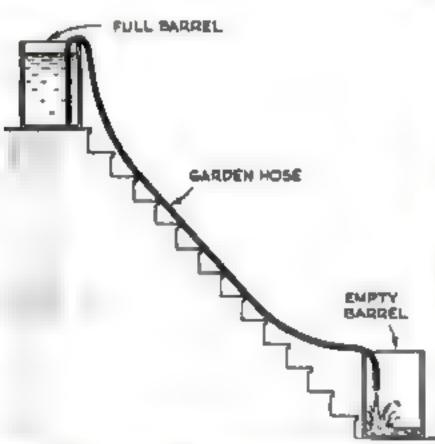




Milk Cartons Used for Seedlings

Waxen milk cartons make handy temporary boxes for carrying seedlings. Close up the pouring spout and cut out one side. For a reasonable length of time, the containers will hold moistened dirt containing the seedlings. I find the two-quart and gallon sizes most convenient to use.—R. M. Woodbury, Natick, Mass.





How I Flowed Oil Downstairs

How could I move a 50-gallon drum of oil—too heavy for one man to handle—down a cellar stairway? My solution: Siphon the oil into an empty barrel placed at the foot of the stairs.

I filled a length of %" plastic garden hose (rubber would deteriorate) with some oil still on hand, stopping one end with a nozzle. The nozzel end of the hose went into the empty barrel, the open end into the full one. Then I opened the nozzle and oil gravitated from one barrel to the other. Water and other liquids can be moved to a lower level in the same way.—Warren M. Smith, Holyoke, Mass.



Sharpening Knives at Home

To sharpen kitchen knives, place an electric drill in a vise and fasten a wornout abrasive disk on your backing pad. Light pressure is all that is needed to sharpen the knives. Use caution never to draw any color on the cutting edge.—

D. A. Rogers, Minneapolis, Minn.

>>> When you have to measure long lengths of wire, pipe, wood, rope, or even boards, you can do it quickly if you have a big ruler painted on the workshop floor. Mark off the space in feet where you have the longest open floor space.—John Mihalick, East Liverpool, Ohio.

These men planned their service— so can you!



Ptc. Frank J. J. Kirchner, Jr. Annapolits, Maryland Braduste,

"I found only the Army would give me just the schooling I

was looking for. Under its technical training program for high school graduates, there are so many different varieties of courses, there's one for everybody. I chose Supply Management, and the course was even better than I thought. You can pick your training, too."

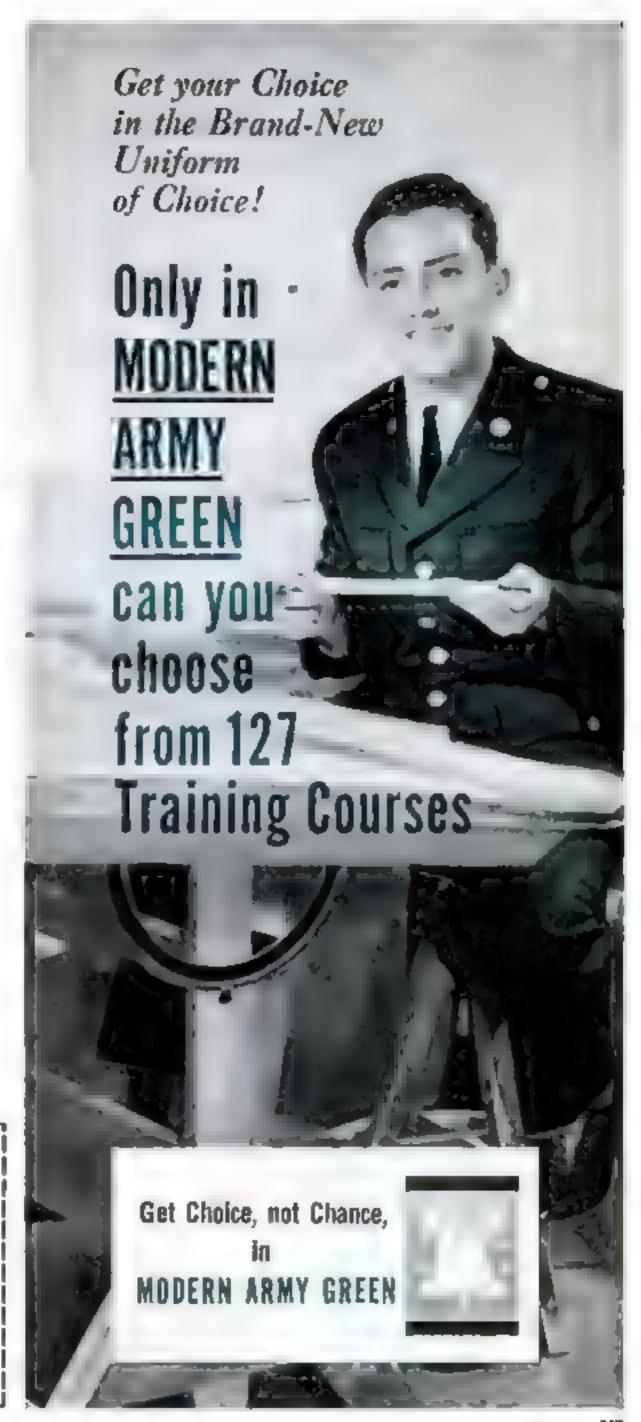
Pvt. James Weikert Dubais, Indiana Graduata, Dubois High School

"I don't know where you could find a better Construction Sur-

veying course than the one I took under the Army's technical training program. What's more, only the Army guarantees you the course you want before you enlist. That was really important to me because I knew just where I was going when I enlisted. I'd sure advise you to find out about this great training opportunity."

Seniors—get all the details on how high school graduates can choose their technical training before enlistment from 127 modern courses. Mail this coupon for your free booklet today. Or for immediate courseling visit your local Army Recruiter. He's listed in the phone book and will give you all the facts—at no obligation!

THE ADJUTANT GENERAL Department of the Army Washington 25, D. C. Attn: AG\$N	P\$-5-58
Please send me the free Army telling how high school gradu choose their technical training enlistment in Modern Army	ates con g before
Name	
Afdress	
CityShah	
Date of Greduction	

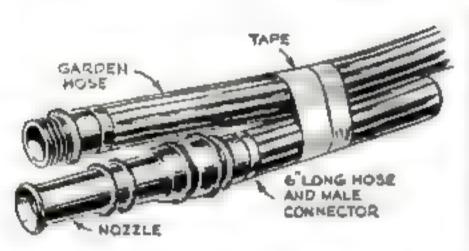


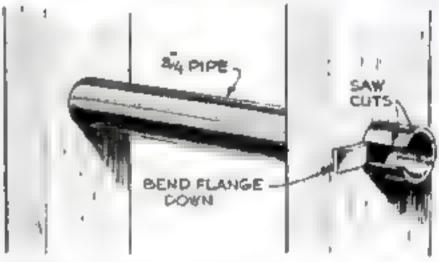


Two Good Points About Wood Bits

HERE'S before-and-after treatment that's easy to apply. A cork screwed on a wood bit will protect it when it's carried in a tool kit. Then, after you use a bit, wipe it thoroughly with a piece of wax paper. The trace of paraffin left on the bit will seal out moisture and prevent rusting.







Now You Won't Lose the Nozzie

Got an old garden hose kicking around? Or an extra hose coupling? Cut off about 6" of the nozzle end of the hose, or attach the male part of the coupling to a piece of hose, and tape it to the end of your good hose like this.

Then you'll always have a place to store the nozzle when you remove it to use the hose for jobs needing lower pressure.

W. B. Eagan, Floyds Knobs, Ind.

Rung Formed from Pipe

I used a piece of 3/4" pipe to replace a broken rung in my extension ladder. After drilling the stubs from the sides of the ladder, I cut the pipe so it would project slightly on either side. Then I cut saw slots in the ends of the pipe, put the pipe through the ladder, and hammered down the ends to form tight-holding flanges against the sides of the ladder.

—Frank lefteries, Bloomfield, N. I.



Here, Now, is a Jack-of-All-Stools

This old piano stool is leading a busy new life after a face-lift rescued it from the attic. The people who own it have used it as a serving table in the kitchen, a plant stand in the living room, a snack table by the TV set—even as a piano stool.

The refurbishing included a new gray enamel applied over a bleedproof undercoater, shining up the brass claws and resurfacing the cracked and battered old swivel top with Marlite in a black-and gold marble pattern.



The De Walt Power Shop can make you AN EXPERT WOODWORKER-

This one power tool makes it easy—even for beginners—to build anything l

Like to turn the attic into a playroom...panel and furnish a room for "Johnny"? How about a hi-fit cabinet? A bookcose...tennis table...a boot...kitchen cabinets? With a De Walt[®] Fower Shap you can make your home fit every family need. And save money, too!

Do Walt is the original radial arm saw... the complete home workshop in one machine that has revalutionized woodworking, made it safe and easy for everyone? Even if you've never used power tools before you can do professional work from the beginning.

With the De Walt Power Shop you always see exactly what you're doing... follow layout marks with ease... never spail expensive lumber. Right from the start you're protected by De Walt's exclusive safety features. What's more, your De Walt Power Shop takes no more room than the average home appliance! And you can own a De Walt Power Shop for as little as \$2.50 a week!

Try-before-you-buy at your nearby De Walt Dealer today!

SEND COUPON FOR VALUABLE PLANS

Another AMF Product

De Walt, Dept. PS-865. Languiter. Pa. Division of American Machine & Foundry Company.

-] Please send catuable Free Home Workbeach Plant.
- I I enclose \$2.95 (check or M.O.) for information packed Operator's Manual. 'Easy Ways to Expert Woodworking.' No. 1.0 D. piersel.

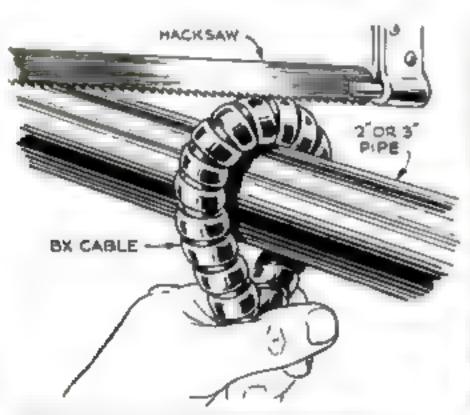
ADDRESS.....ZONE_STATE



Bar is Tool-Box Handle

A WRECKING or pinch bar is usually too awkward to fit inside a tool box, so it often gets misplaced. Used as the handle for a tool tray, however, a bar is right within hand's reach when you need it.—
George L. Housely, Pocatello, Idaho.

knobs from working loose, turn the fastening screw up tight from the inside, then drive a brad through into the knob, also from the inside. The knob can't turn now. But if you ever want to remove it, you can do so by turning out the screw, and then pulling the knob off the nail.—Neal Singletary Ir., Ponca City, Okla.



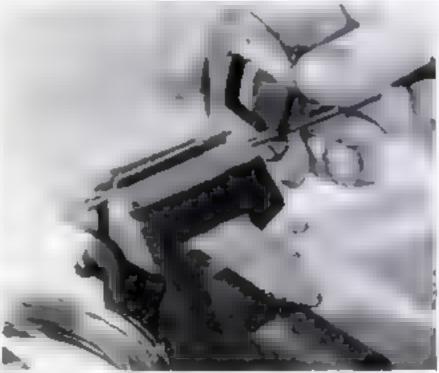
Easier Way to Hacksaw BX

Armored electric cable can be cut more easily if you first wrap it around a piece of 2" or 3" pipe and grasp the two ends underneath with one hand while you saw diagonally across the looped cable on top.

—John Mitchell, Cincinnati.

WHEN you need to match a natural finish that has colored with age, you can nearly always do it with orange shellac. Control the depth of color by thinning the shellac as required with alcohol.





How to Wind Coil Springs

It's a simple job to wind small coil springs if you use a piece of leather and a vise. Use a metal rod as a mandrel, slotting or drilling one end for starting the wire. Lay the mandrel in the folded leather and secure it in the vise jaws. As the mandrel is turned, the wire will form threads inside the leather, keeping each turn against the adjoining one. To make open compression springs, feed the wire into the folded leather at an angle.—

Ken Murray, Colon, Much.

Announcing: nearly 100° of extra protection with new MOPAR "Hi-Temp" Brake Fluid

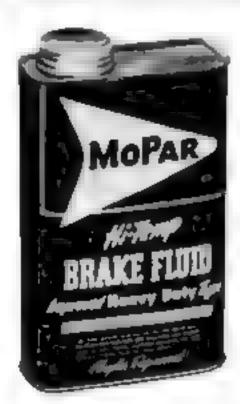


Five years of grueling road tests, over mountain roads, in desert heat and in city traffic... five years of continuous research in Chrysler laboratories.. these stand behind this news announcement of major importance.

Today's new MoPar "Hi-Temp" Heavy-Duty Brake Fluid stands up to heat nearly 100° higher than present specifications established by the Society of Automotive Engineers.

This "difference in degree" can make all the difference in safety, because the friction heat of braking can raise brake fluid to the bailing point—and bubbles in the lines can cause brake fading and failure. MoPar "Hi-Temp" means many extra degrees of assurance.

Next time, make sure you get this entirely new kind of brake fluid. Available at your Plymouth, Dodge, De Soto, Chrysler or Imperial dealer—or at leading independent repair shops.





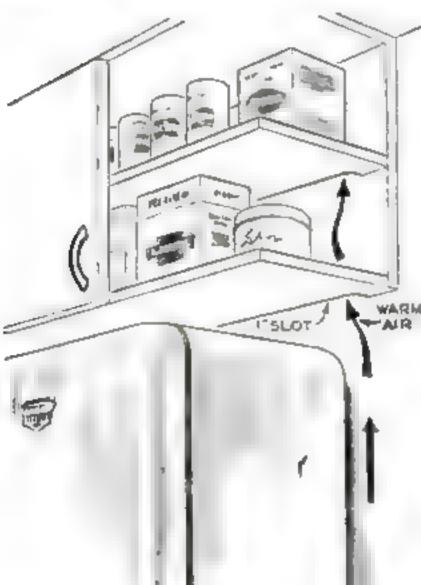
MoPar Division, Chrysler Motors Corporation
Detroit 31, Michigan



Curly snapshots? Roll them flat

Photos that dry with an annoying curl can be made to be flat by running them through a typewriter against the curl. Drawing them across the edge of a table or desk, the usual method, can cause noticeable cracks in the surface of the prints.—Eugene M. Hanson, Los Angeles.





Every time I go on a new job, I bend a piece of metal lath down over the brake pedal because I know that it would take just one slip of the foot to injure someone or wreck a piece of machinery being hoisted into place. The mesh provides friction to keep my foot firmly on the pedal despite mud, grease, water or ice.

—Jack Roodman, Hollywood, Fla.



Refrigerator Doubles as Dryer

IF CRACKERS get soggy and salt won't pour, keep them dry the way we do. I cut a slot (you can drill holes instead) in the bottom and next-highest shelf of a wall cabinet above the refrigerator. Warm air rises from the back of the refrigerator into the cabinet, drying its contents.— William Duggan, Fairfield, Conn.

Spiral-Hacksaw-Blade Repair

I PROLONG the life of a spiral hacksaw blade with electricians' crimp terminals. When an end breaks off I crimp a terminal on the remaining piece, restoring the blade to original length. Repeated breakages can be remedied this way, until only about half the blade remains intact.—

Mrs. Susie N. Dean, Round Lake, N. Y.

SANDING MADE EASY the flexible ball-joint



with Stanley Swirlaway

only \$4.95 complete with 3 abresive discs

- Sands wood, metal, plastics, masonry or fibre glass
- Ball-joint eliminates gouges and swirls
- Sands with rotary planer action
- Fits any ¼ "electric drill
- No heavy pressure required—no mar, no scar

Write for folder T255.

Stanley Tools, Division of The Stanley Works, New Britain, Connecticut.

STANLEY

The Tool Box of the World



Just apply Wonder-Paste with a paint brush. Then take a rest while this powerful remover goes to work. After a short wait, remove the old finish with a putty knife. Comes off in one easy scraping — not coat by coat — because Wonder-Paste penetrates deeply, right down to the wood. At paint and hardware stores.

Effective on paint, enamel, varnish, lacquer, etc.-indoors or out. Stays put on uprights.

 Send 25g for illustrated Manual on Refinishing or write for free Wonder-Pasta inaffet.

WILSON-IMPERIAL CO., 121 Chestnut St., Newark 5, N. J.



Nichalson's Rotory Mower file was made to order for your machine. It's the only file around that was designed for this job. Why tote your machine off to be sharpened when you can do a professional job yourself with the Nichalson or Black Diamond Rotary Mower file?

The Nicholson or Black Diamond Rotary Mower file has a handy hang-up hole for easy staring in your garage or tool shed. Best news of all: it costs only 98¢. Look for it at your hardware dealer's today.

PREE: "FILE FILOSOPHY"—big new edition, dozens of illustrations, on how to choose, use and core for your files. Write for your copy.



NICHOLSON FILE COMPANY

Providence 1, R. I.



(In Canada: Michelson File Company of Canada Lid., Part Hope, Octacia)

HICHOLSON FILES



Store Electric Handsaw in Block

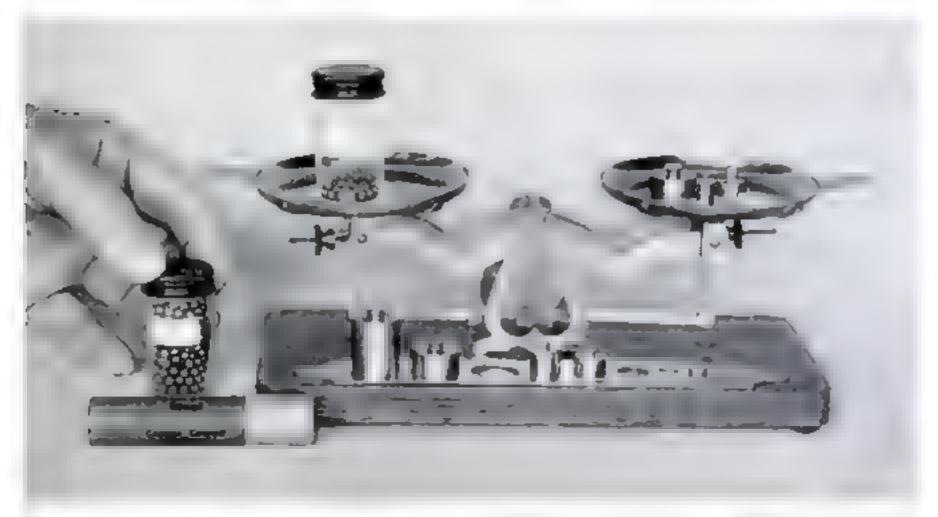
A TRIANGULAR block like this is a fine place to store an electric handsaw on a workbench between jobs. Drill a ½" hole for the blade in the long edge of the block, at right angles to the edge.—H. T. Jamieson, Daytona Beach, Fla.



Some of my records have gotten scratched accidentally, causing the phonograph stylus to jump over into the next groove. I've found that this jumping can be eliminated by stroking the newly damaged groove with a sewing needle. The groove is clearly visible through a strong magnifying glass.—Gerard Lietz, Chicago.

THE canvas on patio furniture lasts much longer if protected by a water-repelling preservative. Before each outdoor season, brush on a coat of the preservative. Steer clear of oil bases—use the liquid that auto-supply stores carry for treating convertible car tops and tents.

—M. Peacock Ir., Radnor, Pa.



Boost Your Scale's Capacity

You can get more use from photo scales of this type by providing extra balancing weights made with BB shot.

An additional four-ounce weight will double the capacity of most such scales, so that you can weigh small packages for mailing. A 3/4-ounce weight is another that's good to have.

Place the weight to be duplicated on one end of the scale and a dime-store plastic container and cap on the other. Add BB air-rifle shot to the container until it balances. Then close and label it. —O. A. Nelson, Seattle.

"Dress up" a bedroom with Western Pine Region woods

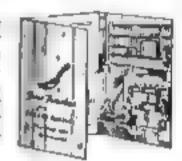


Here's a dressing table you can turn out easily and economically with Western Pine Region woods.

Straight-grained, soft-textured, they're easy to work and won't play tricks on you...you can be sure they're always thoroughly dried and seasoned. You can finish them with any stain, or paint, or wax and rub them up to a satiny, natural glow.

Which of the Western Pine Region woods should you use? Talk it over with your lumber dealer. He sells them for furniture and remodeling jobs, all kinds of projects.

FREE 6 FINISH BOOKLETS. feature unusual Color AND TEXTURE ideas for finishing Western Pine Region woods in traditional or contemporary designs. Plus tips on installing, sanding, painting, or staining these distinctive woods. Write to Western Pine Association, Dept. 205-L. Youn Bidg., Portland 4, Oregon.



Western Pine Association



member mills manufacture these woods to high standards of seasoning, grading and measurement stake White Pine - Ponderosa Pine - Sugar Pine White Fir - Incense Ceder - Deuglas Fir - Larch Red Ceder - Lodgepole Pine - Engelmann Spruce

TODAY'S WESTERN PINE TREE FARMING GUARANTEES LUMBER TOMORROW

spray paint 7 times faster than brushings





93200

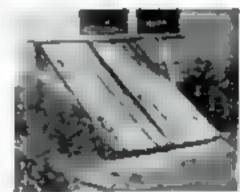
Paints anything from a house to a toy. Saves its cost on the first major job! Speedy Sprayer does in minutes what brushing takes hours. Finish is smooth, flawless. Uses any ¼ h.p. motor with ½" shaft. No. 780 Outfit—10 ft. air hose, tire chuck, quart gun, less motor, only \$32.00. Every workshop should have it. At leading stores.

Free! Write for "How To Spray" Booklet and folder,

W. R. BROWN CORPORATION

Special state Portable Paint Sprayers for Over 37 Years.
2637 N. NORMANDY AVENUE, CHICAGO 35, ILL.

TROUBLESOME WOOD HATCHWAY?





REPLACE ITI

With a modern Bilco Basement Door. All-steel, weathertight, spring-operated. Do it yourself in just 3 to 4 hours.



Write today for FREE illustrated replacement folder.

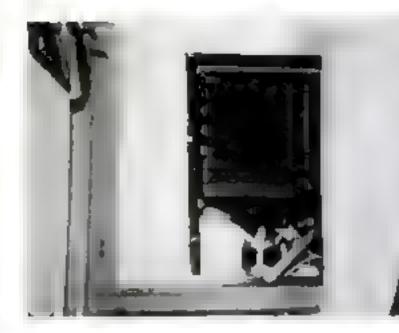
THE BILCO CO., Dept 120 NEW HAVEN 5, CONN.

Please send me complete information.

ADDRESS

CITY STATE





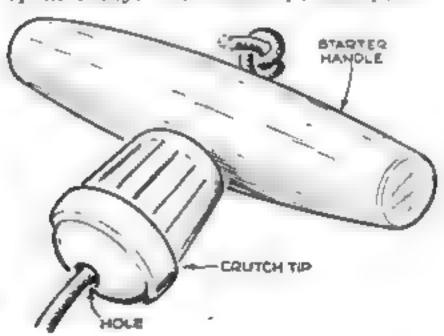


Wall-Mounted Dishwasher

THERE was no room for a dishwasher in our kitchen, but there was wasted space in an adjacent stairwell leading to the basement. So I built a sturdy platform in the well to hold the dishwasher, and cut an opening in the kitchen wall. The dishwasher's front protrudes into the kitchen at a comfortable height for use, yet its insides are easy to get at for repairs.— S. M. Sommers, Hicksville, N. Y.

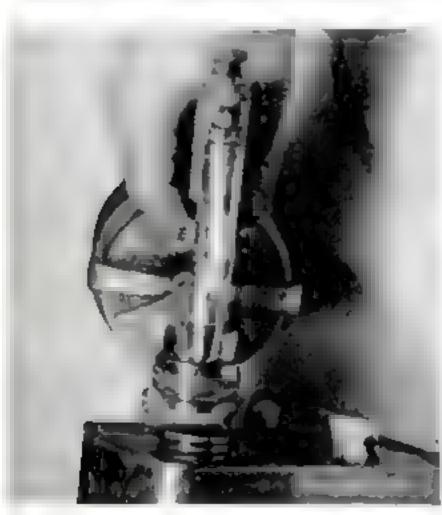
Wax Cures Sticking Window

My Wife complained of a stuck window. I raised it, applied paste floor wax in both channels, moved the window up and down to transfer wax to the sash. Now it opens easily.—H. Hummer, Astoria, Ill.



Taming a "Knuckle Buster"

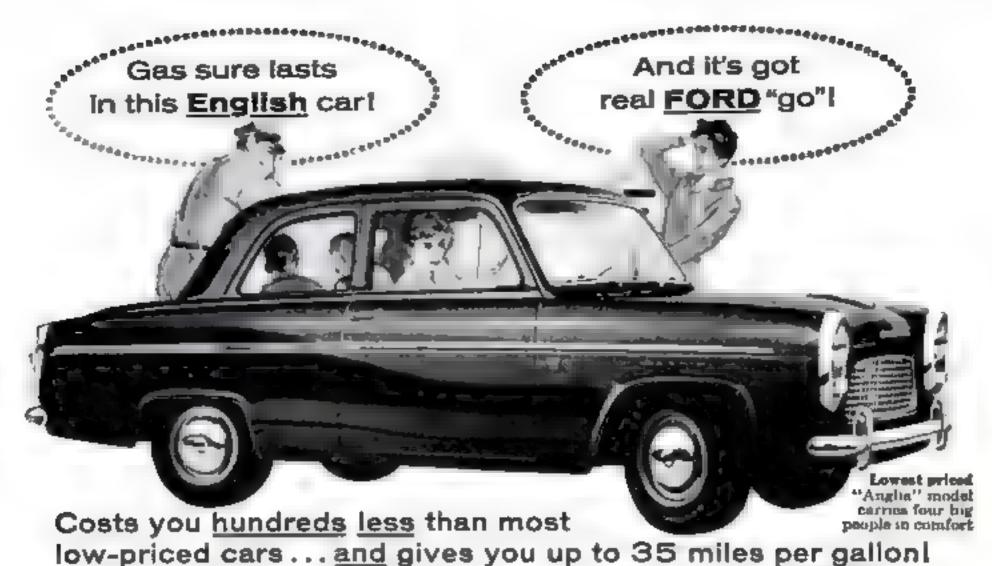
You won't skin your knuckles starting an outboard motor, lawn mower or chain saw if there is a "bumper" on the starter rope. Punch a hole in the end of a rubber crutch tip and slip it on the rope next to the handle. Now your hand won't bang the motor if it kicks back.—Victor H. Lamoy, Upper Jay, N. Y.



How I Salvage Solvent

Solvent used to clean a spray gun can be salvaged by running it into a gallon can fitted with a screw top. Over a period of time a great deal of expensive lacquer thinner or other solvent can be saved this way. I keep it for thinning or for the next time I have a spray-gun cleaning job.—

R. C. Gibbons, Oklahoma City, Okla.



English Ford Line engines are extra thrufty on gasoline, give you lively Ford performance, with power to spare! Service anywhere

because nuts and bolts are

American sizes. See the English Ford Line at your dealer's today.

Made in England for Ford Motor Company, Dearborn, Michigan, and sold and serviced in the United States by its selected dealers.





2500 WATT

GENERATOR

115-Veit, 60-Cycle A.C., Single Phase

Government Cost \$250.00

Brand New SURPLUS Fully QUARANTEED

Only \$1252

Ideal as a permanent of atomic by unit for electricity IDENTE At to your house current. Porfect for farms units a handles lights, refrigerator aleast ship, oh fields mines sic has y handles lights, refrigerator doug freeze out tourser radio, must for agent Real ghis of his pumps sic Att BATE DEARLING Orientals at 3000 KPM lights with 5-212 or larger engines or use power take off. Vo. age sett regulating Standard Case may Two our six Size 15" hour 5" din Wet 63 the 22st water 1987 No. 182 Yi

SUPPLY LIMITED! ORDER DIRECT PROM AD Free Catalog of other Surplus, Hydraulics ROBERTS ELECTRIC CO., Dapt PS-790, 849 W. Grand, Chicago aZ, III.



Do it now with

Use DAP Kwit-Seel " for water-tight joints around bathtub, sink, tiling, basehoards. A wonder-white scaler. Long lasting. Get handy tubes and free do-it-yourself booklet at hardware, paint and building supply dealers.

DICKS-ARMSTRONG-PONTIUS, Inc. General Offices. Daylon, Ohio

The Car That Drives Itself

(Continued from page 19)

are linked to police headquarters by Sigalert receivers. When the cops have an urgent message for the public, the police radio dispatcher pushes a button, transmitting a tone that triggers the Sigalert equipment in the studios. A warning light goes on, and a tape recorder starts rolling to take down whatever the dispatcher says (police cars hear him directly). The studios can then interrupt their program and play the tape back to their audience.

All the experts I talked to foresee an extension of the Sigalert idea right into the car itself. Here's how they picture it:

A small transistor radio would turn on automatically with the ignition key. Permanently tuned to the highway station, it would be silent until the highway police had something to say. Then it would override your regular radio.

At first, one transmitter (or a few) would let the cops talk to everyone on the road. Gradually additional transmitters, of lower power, would be spotted along the road to limit communication to fewer cars and thus offer individualized information. One such station, for exam-

ple, might be spotted at a curve and provided with a tape that repeated to every passing car: "Sharp curve. Slow to 35."

With more transmitters, oral speed limits could supplement signs—and they could be varied to suit the weather. Later, the car's receiver might be connected to a second speedometer needle, which would automatically change to show the speed limit for each stretch of road. Eventually, the connection could be shifted to an accelerator-brake control for complete electronic monitoring of speed.

How safe can you get? By profession, Detroit researchers are dreamers. But they do not dream about human nature. They expect that new safety devices will lead many motorists to accept new risks. The net gain for safety may be small.

GM's Joe Bidwell puts it this way:

"Everybody imagines a system that will let him read a magazine while he drives a superhighway at 70 miles an hour. When we put that into a car, people will read magazines, or even lean back and go to sleep."

Chrysler's research with simulated ra-

Faster, safer way to wash your car



DU PONT CAR WASH

Du Pont Car Wash gets your car so clean it drains dry, without wiping. Unlike ordinary detergents, it's safe for wax and it doesn't streak! At service stations and auto supply stores—
32-lb. can only 75¢.



BETTER THINGS FOR BETTER LIVING



226 POPULAR SCIENCE

The Car That Drives Itself

dar braking confirms this suspicion. The simulated radar was a live engineer sitting in the right front seat. He operated an extra brake pedal the way an ideal radar would. An experienced test driver at the wheel was told that, despite the "radar," he was fully responsible for safe handling of the car and that he should use his own brake as he felt necessary.

Chrysler's safety engineer Roy Haeusler

tells what happened.

"The driver let the automatic system take over. A number of potentially dangerous situations developed. For example, the driver would let the automatic control bring our car to a stop at a traffic light whenever another car had to stop in front of him. He would then tend to forget that the automatic control could not bring our car to a stop at a traffic light when it was the first car at the light,"

The timetable. Such experiences, plus radar's penchant for unnecessary braking.

led Hagusler to conclude:

"The complexity of the traffic problem and of human responses will indefinitely postpone a successful automatic brake."

Haeusler's opposite numbers in the other companies are more optimistic. Their feeling: Some things can and should be done to simplify routine driving, freeing the motorist to watch for danger.

I got the impression that some of these things that can and should be done are now ready to pop, in roughly this order:

 Styling changes to increase longrange visibility (of stop lights mainly).

Police-to-driver radio, via present car receivers at first.

3. A proximity-warning device that will: a) blink your tail lights at another car approaching too close to you, b) flash a dash light at you when you get too close to somebody else, or c) do both jobs.

 A real highway test of the GM-RCA system, probably arranged to display steering and braking information on dials.

None of these developments will take the decision away from the driver. They will leave actual braking, acceleration and steering to him. But they will signal him extra information so that he can make his decisions more easily and more surely.

Once these semi-automatic black boxes prove themselves on the road, it will be simple to tack on extra servos. Then you'll have the car that drives itself, END



HANDLED WITH GLOVES!

Wearing protective gloves, this girl gently stacks Federal-Magul engine bearings on a magnetized bar. Next step—final plating for these "jewels of the engine."

in engine bearings . . .

FEDERAL-MOGUL means FINE PERFORMANCE

Only the best precision insert bearings are good enough for today's high-demand automotive engines.

Research, design and quality-controlled production are proved in service. Good mechanics know this . . . that's why they specify and install Federal-Mogul service bearings.

Remember—in engine reconditioning, Federal-Mogul means fine performance. Ask your mechanic!







flow/usely to hand-rabbed finish,

applies easily erginelin. 4.0 no

e pes. Wunt able. Durable!

metal sash, doors, shutters.



I Lum nall Perch & ficer Enamal H gh gloss for a I floors, inside or outside, heavy duty.



3 Concrete Frant Paris Quick dry tough finish for Page Pation Ensy to usel



10 1 pm nati Di R to Frame Interior & exterror luster for yachis machinary furni-



I Sem Chart Was I mish K Ichen bethti m enamel 10 maigh alkyd flat colors,

Millions of happy users know Luminall Paints apply easier, look better, last longer, cost less per square foot. That's why they're called "Miracles" I



Chicago 9 Newark 5 Los Angeles 5 Da. as 7

What the Satellites Tell Us [Continued from page 8.]

It explains why Sputnik I, which U.S. experts originally expected to stay up for a year or more, met a fiery end after only three months. Satellites must be shot higher, it shows, to escape air drag and last as long as intended. The new finding was announced in time for application to Explorer I and Vanguard I. Since their orbits have minimum heights of 219 and 407 miles, compared to about 150 miles for Sputniks I and II, they are expected to stay aloft for years instead of months.

Planners of future space platforms, to serve as way stations for travel to the moon and beyond, should also take notice. Some, who have been talking of altitudes as low as 150 miles for space stations,

had better raise their aights.

Dog-carrying Sputnik II proved for the first time that a living creature could survive a week of weightlessness. While this had been surmised, previous "zerogravity" experiments with animals were limited to a few minutes, in falling rockets: and just such a prolonged satellite experiment had been declared neededby Dr. Hermann J. Schaeffer of the U.S. Naval School of Aviation Medicine.

The apace-traveling dog Laika, by Soviet report, was unharmed by weightleasness. It survived for seven days, artificially supplied with oxygen and food, while instruments reported its pulse, respiration and blood pressure—until exhaustion of the power supply terminated

the experiment and Laika.

Surprisingly trailing the U.S. in announcing satellites' space data, the Russians took four months to reveal scientific details of the Laika findings. What else their Sputniks' beeps had told, in secret code, the world was still waiting to hear at this writing.

Simply by observing the Sputniks' orbits and their radio signals, however, Western scientists have been able to learn

a great deal.

The earth's bulge at its waistline affects the satellites' orbits, so they should tell by how much the earth's radius at the equator exceeds its radius at the polesand whether a current Russian estimate. or a different Western one, is the nearer right. Early satellite observations seem to favor ours. But settling the question must await long study of precision photo-

228 POPULAR SCIENCE

What the Satellites Tell Us

graphs being made with big satellitetracking cameras. So must measurements expected to give, more accurately than ever before, the distances between places on different continents—a matter of keen interest to missile men as well as to scientists.

Sputnik I had a "ghost." Sometimes its beeps seemed to be coming from right overhead, when it was actually on the opposite side of the world—a new and mystifying radio phenomenon. And the beeps reached radio receivers by other curious paths, more devious than direct line-of-sight. Unexplained varieties of fading were recorded. Study of these radio observations may throw new light on the nature of the ionosphere, the electrified region beginning about 30 miles above the earth's surface.

An Ohio State University scientist reported echoes of WWV radio time signals from Sputnik I—as from meteor trails, but stronger and longer. Thus he observed the sphere's final breakup, into a procession of eight fragments taking 30 minutes to sail by

Getting the satellites' data began in near-frenzy. When Sputnik I startled the world last October 4, no one knew for sure how long it would stay up; its successful launching might be a lucky accident, not soon to be repeated. Observers must make the most of their opportunity. All night Moonwatch headquarters alerted its teams by telephone, telegraph and cable.

This had been the plan: First a satellite would be tracked by Minitrack's direction-finding radio receivers—backed up by Moonwatch's visual observers just in case the moon's radio failed to work. Then, since optical tracking is much more accurate than radio tracking, Minitrack's orbit predictions would direct our big tracking cameras to the satellite and they would take over. But that was for U.S. satellites still to come. Sputnik threw the schedule into confusion.

Ridiculous-looking little television-style aerials aprouted from Minitrack's great radio antennas. Unknown to Western scientists until a few days before the launching, Sputnik's transmitting frequencies, to our experts' consternation, were different from ours. As for the satellite-tracking cameras, the first of the 12 instruments



PROTO'S



MAZZANTE MAENENEN

GOLDEN KNURL HOLDS EXACT JAW OPENINGS AUTOMATICALLY!

HO BUTTONS ... NO LEVERS ... NO GADGETS

Use it like an ordinary "adjustable", Merely turn Golden Knurl, jaws click automatically into desired opening . . . even non-standard and foreign sizes. Jaws won't work loose. Drop-forged, fine Protoloy steel. Thin head for tight places. Highly polished, chrome plated. Job tested and approved by mechanics, coast to coast. Try the Clik-Stop now!

Federal Specifications: GGG-W-631A, Type 1

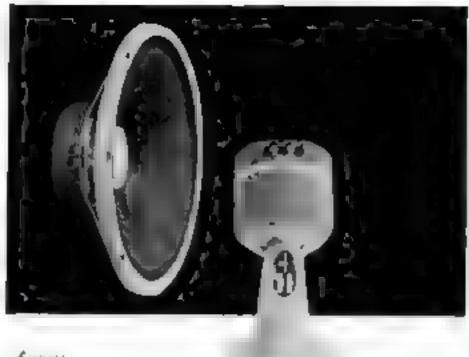
Available in FIVE popular sizes

4," 6," 8," 10"& 12"





2209 Santa Fe Ave. Los Angeles 54, Calif.



from detailed production

prints BUILD YOUR OWN JBL ACOUSTICAL ENCLOSURE

reward your painetaking craftemanship with speakers designed for the perfectionist

Get the greatest thrill high fidelity can give you ... full range, rich, clean sound from precision 18t. Signature loudspeakers mounted in an acquistical anciosure you make with your own hands, JBL units, such as the Model 0130 and the 175DLH, are acknowledged by foremost authorities to be the finest made. The highly efficient D130 is the only 157 extended range speaker made with a 4" voice coil. The JBL Model 1750LH, equipped with a JBL accostical lens, gives you smooth, crisp reproduction of audio frequencies above 1200 cps. Any apeaker, If it is to give you accurate base reproduction, must be mounted in a properly engineered acoustical enclosure.



C40

Designed specifically for the JBL D130, the JBL back-loaded folded hore is probably the most widely used enclosure of its type ever manufactured. The cabinet in relatively small—less than 40° in its greatest dimension—and yet, ingeniously folded within, is an exponentially tapered horn gath with an effective length of six feet. The horn adds an Octave of accurate, clean, deep down bass. There are two versions of the

BUILD A JOL BACK-LOADED FOLDED HORK

horn: Model C34 stands vertically; Model C40 is given horizontal "low-boy" styling. Now you can build one of these most popular JBL enclosures from detailed production prints which include a complete list of materials, all dimensions, and instructions for assembly. Cost is three dollars per set.

USE THIS FORM TO ORDER YOUR PLANS

	JAMES B. LANSING SQUAR, INC. 3249 Casitas Ave., Los Angeles 39, Calif.
A	Gentiemen: Enclosed find \$for
X	@ \$3.00 per set. Please print clearly or type your name and complete address:
GBL	Address

What the Satellites Tell Us

was still short of completion at Pasadena.

So for a while it was unexpectedly up to the amateurs of Moonwatch to provide the only available precision observations of Sputnik L And they covered themselves with glory. Not only did they come through with hundreds of scientifically useful sightings of Sputnik I's rocket, and the harder-to-see satellite itself. They even furnished nine sightings of the rocket's separated nose cone, giving the needed proof that it was also in orbit.

Radar, almost unheralded as a means of satellite tracking, proved useful here and abroad—especially in bad "seeing" weather. Hastily converted into a radar instrument, the great 250-foot-diameter radio telescope at Jodrell Bank, England, picked up Sputnik I-and, by cabled Russian request, furnished orbit data after the moon's batteries went dead.

By now, the hectic improvisations of those first days are history. The big tracking cameras have gone into action. Completed in time to catch a few photos of Sputnik I and its rocket, the first was set up in New Mexico. Others have since gone into service in South Africa, Australia and Spain; by mid-June, all 12 should be working.

Developed at once, the cameras' pictures immediately furnish data to a computer predicting a satellite's path, to help observers keep tabs on it. But the final precision measurements, and the scientific findings to result, will wait until the end of 1958 and the International Geophysical Year. Then all the photographs will be assembled at the Smithsonian Astrophysical Observatory for the painstaking task.

Meanwhile, watching the man-made moons might indirectly yield a surprise:

Will satellite observers discover any natural satellites, too fast-moving and small ever to have been seen by astronomers' telescopes, circling close to earth? Chances are considered dim, but the possibility still can't be ruled out. So the Smithsonian has been studying all reported satellite sightings that don't fit the orbit of any known man-made moon. If some of the offbeat data should fit together and yield a different orbit, at any moment we might hear the surprising news that nature has given our own satellites competition. END

CARBURETOR CLEANING

the quick, easy way



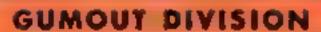
Your car will run better, smoother, more economically when you clean the carburetor with GUMOUT. Simply add to the gas. Cleans as you drive.



GUMOUT is a "must" for Power Mowers and all small engines. Cleans out the fuel system fast. You'll get quicker starts and smoother, fivelier engine performance.

Available at auto supply and hardware stores, or wherever automotive products are sold.

> Send for FREE 46-page "CARBURETOR HANDBOOK."



Pannayivania Rafining Company 2675 Usbox Rood, Cleveland 4, Ohio

1-0Z.

89c



NEW POR 1989: CATALOG FOR

MA-KAY PHONOCASE PLASTIC BOATS, BOAT BUTS AND PRILAS



From E.R. Sull) to party-marco.

Plangin Ett Cototop: Compre, include hardware print skilliffer and hardware. No shape of Starger majories. Send 5 50 for last analogy plan



Over 200 fames, 410s France 2003 PERSONAL PLANS B' - 3 All Types Peace, Biffs AVAILABLE Cruticis, Etc. No. Pay required have blan-tall Assoluble Easy to Build! Alm foot & Curion. Fictions Quantum rows (CHP prints)

MIND My FOR ALPO, CATAGOD AND IN PO. "MA-MAY"

"BOATING HANDSOCK," DEALERS-ADENTS INDUSE

CUSTOM-CRAFT-BUFFALO [AL] NEW YORK



LOK-BLOK F makes blade twist and impact proof

MATERIALS.

AMO Workmanship

PINT

\$1.50

ERIPPER recedes deep into handle giv ng fut blade use. SPECIAL BIT file both types cross-

-YET COST NO MORE THAN ORDINARY SCREWDRIVERSI

At Looding Doclars Everywhere

point screws.

UPSON BROS., INC., ROCHESTER 14, N. T.

U. S. GOV. SURPLUS

Heavy duty compressor for continuous operation, with G.E. or equal B.B. Motor, 110 V., A.C. rated In h p., develops over ¼ h.p., 1-quart Pressure type gun with round, fan and ceiling spray nozzies. Line fliter, air drier, air gauge, 20 ft. cord &



U.S. SURPLUS AIR TANKS

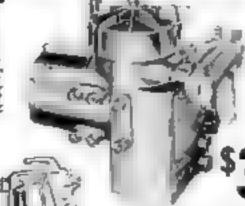
Size 8'4" x 20" Two the open use in the pressure With test and hand a With the pressure With feet and hand a With Ir the Orly nat cost the Orly not on \$6.95



SURPLUS MOTORS

d E. of W H (4 A L/10 hp B B 110 V 1 ph 1751 r p m et) ev A C 11 17 e overload for continuous due Totally en c need by share 8 recentled DE BE 10 PG Overload for con-tinuous the Totally en-cised by shart 6 re-tnovable threaded study for vertical or horizon at meinting third & play Wt. 22 Ho. key \$50 value 1 \$ h.p. 1/10 h.p. \$3 95 \$8.88 plug, 20 ft. air hose. Sprays paint, lacquer, enamel, insecticides, etc. Paints house, auto, ANYTHING. Instructions furnished. NOTHING ELSE TO BUY, Wt. 60 lbs.

Appens. ortelant \$325



ORIGINAL **T203** くつつこ

APPROX.

ORDER FROM THIS AD. Money Back Quarantee. Send check or money order.

LLINOIS MFG. & SUPPLY CO. 1820 S. State Street Dept. PSS, Chicago 16, III

Exclusive: Extendable Mandles for Extra Leverage

Center cut expe he't curter for soft or medium tard ruda and bolts, alloy wire, and other metals. Cutting edge has equal bevel on each elde for extra strength.

FOLDED-It flis into your perket or tool tex-entrty latch locks closed when not in one. Capacities median hard he is in thread. %", meetam hard setals 16" Length closed 10%", extended 15%"

A \$9 95 VALUE

NOW \$3.95 2 FOR PPO. \$7 00 ONLY



WALKER 5-TON BRAND NEW HYDRAULIC

FOR - 4 SHOW PLOWS 4 TO DUMP FARM WAGONS & ADJUST DEPTH OF PLOWS & HYDRAU-LIC PRESS & HYDRAULIC JACK. THE COMPLETE RIT CONSISTS OF: 1 Walker Hydraulic Hand. Pump—Rated 1500 bs. per equinch with 2 set bydraulic reservoir & Release valve & Price plug and his yent & 38" steel presses and minus inches.

handle. Fine for hydraulic presses enow plows, jacks. Di monsions 6" Dismeter 29' long with " pipe 23.50 thread part Pump Assembly Item #P649
1-6 Ft. length double with braid subject covered hydraulic hone—tested to 20 300 the Item #2.84
1-Hydraulic Cylinder, 3" bore 6" stroke Husky " solid steel chaft. Will lift 10 300 the using 1560 the of pump pressure Clevis mountings that take " diameter plus May be used for surgle or double action service. Overbe used for single or double action service. Over-all length 1744 -retracted Item #C419

I-Gallon hydraulic fluid furnished free with each kit Plus all necessary hydraulic fittings. Total ship wt -40 lbs.

ZOB. COMPLETE KIT PRICE 38.95 (ALL OF ABOVE INCLUDED) ... CHICAGO

H.P. 12 VOLT ELECTRIC MOTOR



IVEM #208 - o For electric wheel chairs (Pop. Mech. design-Mar 1959)

Por electric golf carts.

For self propelled ecopiers, children a midget cars
Rated 1 HP -100 amps. 5500
RFM 12 vots. DC -This double
volts for lower horsepower requirements—Standard a
shaft, flange mountage - Dimensions 9' 12.50 these

2 M. P. SLECTRIC MOTOR

From #315-24 Vers DE Auge 4000 Head Spline shaft both

thehi, For B. htman

SELF-PRIMING—BRONZE

FOR - Sprinkling . Basoment **Draining & Fuel Transfer**



.. Insecticide Spraying BUILT TO EXACTING M. S. NAVY STANDARDS

OUTPUT: 20 Gal per Min 100 lbs per Sq In. at 1500 RPM —8 Gal per Min at 550 RPM • Standard Base Mounting—2, bolt holes • Grease cup included • 1 Pipe Thread Ports • Dim. 11" L x 5" H x 414"

26.50 FA
W Ship Wt 15 lbs

Limited Quantity Order Direct

2 for 56.00 B. Chicago

FREE! SUMMER 1958 CATALOG

60 VALUE-PACKED PAGES of unsurpassed War Surplus and newly manufactured Equipment Sorgains for farm, home, factory, workshop. Write letter today.

Order Direct from Ad. 2cod Payment Or Purshase Order Today For Phone Orders Call WEbster 9-3793

Now Everybody Wants a Telescope [Continued from page 97]

by the efficiency with which mirror surfaces reflect light. Wartime technology has developed aluminum reflecting surfaces substantially more efficient than the older silver surfaces. Aluminizing—and quartz overcoating to protect the surfaces ---has practically eliminated an old bugaboo of reflectors, the frequent need to resilver the mirrors to maintain efficiency.

All good reflectors have a parabolic mirror. Painstaking hand correction is required to attain this shape, so it is more expensive than the simpler spherical mirror. The accuracy of the mirror surface is given as a fraction of a wave length of light. A good mirror will be accurate to 1/2 wave, while an extremely precise one may have a specification as high as 1/20 wave. Very inexpensive reflectors usually use a spherical mirror. In telescopes with a focal ratio of f/11 or higher. these can give you excellent performance for the money.

A stable mount is essential for any good telescope. Anyone who has tried to cope with a palsied planet on a breezy night will agree that at least half the usefulness of a telescope depends on mounting. The altazimuth mount allows motions about a perpendicular axis for horizontal, or azimuth, adjustment; and about a horizontal axis for vertical, or altitude, adjustments. It works like a surveyor's transit. It's fine for mundane viewing or casual peeking at the moon. But for satisfying exploration of the stars and planets an equatorial mount is more convenient.

To understand how an equatorial mount, in its simplest form, works, imagine the altazimuth mount with its perpendicular axis cocked at an angle so that it is parallel to the earth's axis. You set this by pointing it at the pole star. It is now called the polar axis. When it is properly adjusted you can follow any star by the single movement about this axis.

Of course there is much more that goes into making a good telescope, but if you heed these pointers, you are not likely to be disappointed with your first purchase.

If you want to see where we are going in those space ships, and if you want to span distance with the speed of light, you may be next to succumb to the lure of the telescope. END

new G-E pa-20

20-watt amplifier in handsome leather-grain cabinet





Chack these fine performance features:

 Smooth, clean response from 20 through 20,000 cycles
 Phono input hum level below — 60 db at full output ■ Overall distortion level of less than 1% at full output ■ Phono. input sensitivity 5 to 6 my at full output . Accurate phone equalization.

Unusual L-C timed circuit in rumble filter filters out rumble and sub-nudio frequencies.

Five separate inputs, three outputs and seven

controls fulfill every home audio need Modern leather grain finish, extra size control knobs and gold-brushed escutcheon

Ask for a demonstration of the new General Electric PA-20 Ampliflur-Preampliflur at your Hi-Fi dealer's soon. Mail the coupen for complate specifications.

GENERAL (ELECTRIC

Section Aubun	ı MF, 1 n, Nev	Nesi Ye	Geneses rit						
Please Name.		me	complete	specification	L on 1	he	new	G-E	PA-20
Addres	55					_			
				_			A		





INTERIOR WOOD PROJECTS Seals, primes, finishes. Nothing else to use from raw wood to bat-top finish. Dries in 30 minutes,

MORE THAN A WOOD FINISH



PROTECTS TOOLS FROM RUST Cost tools with Deft, Non-Sticky, Makes table-saw tops smoother.

DRAWERS, WINDOWS will not stick, Coat runners Scalides for smooth operation.





PROTECTS NEW WOOD againts warping, darkening, grime, fingerprints, pencil marks.

See your dealer or write for free Deft booklet. DESMOND's, 1928 W. 54th St., Los Angeles BZ, Calif.

NEVER AT THIS LOW PRICE! GENUINE 150-POWER ACHROMATIC TELESCOPE with Achromatic Lens and 4-POWER FINDER attached.

EXTRA BONUS GIFTS:

· 273 page book, "Handbook of the Heavens

 Mogic Stor Finder Dial

 220X & 400X Eyepiece lenses

5 Magnifications 18X—35X—65X—85X—150X Brings the Moon, Flanets, Stors, Satellites, People

150 times Closer, Clearer, Shorper has an Attitionation 150X telescope with Never before has an At HkOMAT C 150X telescope with range finaer and triped and for anywhere hear the amazing low price. Now a sa can not only explore the heaterst and brang the moon planets stars sat 4 lbs 150 three concer but you early observe a , if stant objects, people, ab per topretotes are erect nor uporte down as in all no conon cut telescopes. The kind of mostle starp color-free clessing only a genu ne act commute the continue to the light to the first telescope for the mediate use 5 presision between 5 the your year no at 18% 35% 65%. use 5 processon lenses being you saw no at 18% 35% 65% 55%—150% Tables extend to 43° mode of bakel to finished in capiers being we back rejuded with greathing brase. A power finder stape (White lens) mounted on main, the in fegigre total ly forget on a one expensive total or main, the in fegigre total ly forget on a one expensive total or main, who is fegigre total ly forget on a one expensive total main stope. For extracts in 5 ft hardword folding report is equipped with heavy cast from head fitted will olding report is equipped with heavy cast from head fitted will therefore famous 360 degree plantum num mount that locks instantly in any position total public above only fermit triceron to at pipel prepared 4 famous girts above only fermit riterion to at pipel prepared 4 famous girts. 273 page book Hanabook of the Hearens. Mage was finder that adds in forstone stars ANY WIFERE at ANY T ME of the sear 220% & 400% excludes lenses included five for experiments. You must be completely satisfied with this super offer or your money back in full. Shipped Complete, nothing else to buy at attactingly low price of \$10.00. Without triped \$14.00.

Sond Cash. Check, or Money Order today.

Best. FST-26, CRITERION CO., 331 Owerh St., Herrisod, Camb.

Boys. PST-26, CRITERION CO., 231 Church St., Hariford, Carps.







The car, the floors, the furniture, everything will shine like new when this Sioux Electric Polisher Sander joins your family. It arrives ready

to work, complete with Wool Polishing Pad, Polishing Wax, and Abrasive Discs. A handle for polishing floors and a drill chuck with 7 drills are optional extras.



Look for SIOUX In the yellow pages under "Bectric Tools" Write for E



ALBERTSON & CO. INC. SIOUX CITY, IOWA, U.S.A.

How to Boost Your Test Score

[Continued from page 129]

Some are speed tests that no one is likely to finish. So don't worry if you can't. Just keep working at top speed without stopping for second looks. Skip the hard questions and go back to them if you have time.

Tests of knowledge are worked out to let 80 to 90 percent of the average group finish. Easy and hard questions are mixed so that practically no one makes either zero or perfect; the average is slightly more than half correct.

Objective tests involve completion, matching, multiple-choice, rearranging,

Zone Mail Indeed Results in Speed

The Post Office has divided 106 cities into postal-delivery sones to speed mail delivery. Be sure to include zone numbers when writing to these cities; be sure to include your zone number in your return address—after the city, before the state.

analogy and series. There are techniques for bettering your score on each kind.

• Completion tests. Look for hidden cues. The length of the blank space may hint at the length of the word you need. The phrasing may suggest a plural word. A blank preceded by "a" or "an" is a tip, too.

• Matching tests. Do the ones you know, guess the rest. Completing the first few will reduce the range within which you'll have to guess.

• Multiple-choice questions. Look for "distracters"—words that have nothing to do with the subject but sound right. Eliminating a distracter helps your odds in guessing right and often points straight to the correct answer. Here's how it works:

If answer choices to a question about angles include "abstruse" and "obtuse," you can spot "abstruse" as a distracter; it does not apply to angles. Since a distracter is meant to pull you away from the right answer, "obtuse" is a good guess—even if you have not the faintest idea what the question is about.

Sometimes you can eliminate by logic.

Try this one:

American fighter planes are usually armed with machine guns of: 22 .30 .32 .45 .50 .57 caliber.

Be suspicious of the extreme answers;



WOODWORKERS! DIAL-

Look what you can do on your power saw with the

-ameta Quick-Set Dado Multi-Tool

JUST "DIAL-A-CUT." This versatile, precision tool cuts perfect dado grooves, rabbets, panels, bevels, miters and ploughs, with more accuracy and speed than any tool you've ever used. Without removing it from the arber you can set it for any cut up to 34" deep and 34" to 13/16" wide, or any hairwidth between! You can make tighter fitting shelves and joints, stronger furniture, easier and quicker.

FAMOUS WITH PROFESSIONAL WOODWORKERS

The COMET is perfectly balanced, runs true, smooth, no wobble, vibration, burning or chewing. High speed, self-cooling, tool-steel blades stay sharp 5 times longer than ordinary dados, it fits any table or radial arm saw, fils shafts 34" or 54" and is adaptable for right or left hand rotation. See your dealer or order direct with check, money-order or C.O.D. Now available at greatly reduced price because of vast demand and volume production.

CONSOLIDATED MACHINERY & SUPPLY CO., LTD. Dapl 58

2033 Santa Fe Ave., Los Angeles 21, California A DIVISION OF THE SIEGLER CORPORATION

NOW! A SHOPSMITH FOR ONLY \$179.90

Mail postcard today for free catalog on the new SHOP-SMITH Mark 2 to MAGNA POWER TOOL CORP., Dept. 106 S. Menio Park, California, or Dept. 106-S. Box 2808, Ft Wayne, Ind ans.



Get New 132 Page Catalog of AND WOODWORKING

Amazing one hand operation, ID times faster than hammer & nails: Can't jam



DQ-IT-YOURSELF TACKER, No. T-50

for ceiling tile, insulation, wire fence & every home job

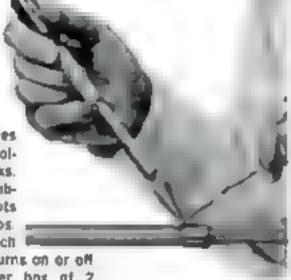
Arrew Fastener Co., Inc., 1 Junius St., Brooklyn, N. Y.

POCKET SIZE BLOW TORCH

only with charger

Butane gas blow torch gives Intense 3500° flame Solders, brazes, fixes leaks. Perfect for wiring, plumbing, loosening frozen nuts and bolts, 1001 add jobs Carry in your pocket. Each

charger lasts 1/2 hour, turns on or off Extra chargers, 49¢ per box of 2.



Get Jet King Butane Blow Torch at hardware stores. Or, send check or money order, we pay postage. For \$1 more (total \$2.95). get Soldering Kit: torch, tip, 3 feet cored solder, extra charger Good for TV, radio, jewelry. Shipments Limited to the U.S.

KIDDE MANUFACT	URING	CO.,	INC.,	Dept.	PS-55
56 FARRAND	ST., 6	LOOP	AFIEL	D, N. J.	

Send meJET KING BLOW TORCHES @ 1 95 ca.
Send meJFT KING SOLDER KITS @ 2.95 ea.
Send meBoxes of Extra Chargers @ .49 per box.
My checkmoney orderfor \$is enclosed
NAME

STREET

STATE

How to Boost Your Test Score

they are more likely to be wrong. Here you may recognize .22 as target-rifle size and .57 as unfamiliar and unlikely (it's an old buffalo gun). Now, from logic, information or sheer guessing, choose among the remaining four. At worst you have a middling-fair chance of hitting right answers, because you have eliminated two wrong ones. (In case you're still in doubt, the testee was supposed to choose .50.)

It is even possible, without a trace of information, to sift out the likely answer. Here is a sample from a U. S. Naval Academy achievement test.

The action of A Tale of Two Cities takes place in:

1-Glasgow and London

2-New York and Paris

3-Vienna and Rome

4—Paris and London

5-Dublin and Edinburgh

Now notice: Two cities, and only two, are mentioned more than once. They are Paris and London—and "4" is indeed the correct answer.

 Rearranging items (for example: Number in order of invention the steamboat, trolley car, wagon, railway). Make your own list in the margin, putting in order the ones you know. Then it's easier to guess the others.

 Analogies. These are easier if you first establish the exact relationship. Here is a sample from a Naval Academy aptitude test.

Megaphone is to voice as:

1-atomizer to nose

2—electricity to radio

3—reflector to searchlight

4-electricity to searchlight

5-earth to heaven

Make a clear statement of the relationship between the two given words—"A megaphone projects the voice in a beam." Then you quickly see that only No. 3 contains words in the same relationship.

True-false tests. Do the ones you are sure of first, then go back and do the rest. Don't change an answer unless you're pretty sure. First guesses are more often the right ones.

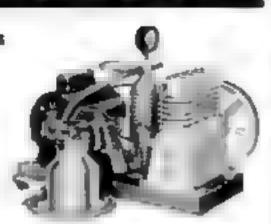
Be suspicious of flat statements that allow no exceptions. Words like "always," "invariably" or "never" usually make a statement false. Watch also for the tiny



. v b . 22 35 ,



Professional results everytime with PRESSURE QUICES the only 4 cyl. gortable air compressor



Non pulsating, continuous air flow for fine finishes... spraying house or barn...fast ..easy...sprays paint und uted, 4-5 times faster than brush - better too!

Write for details and name of your nearest dealer.



The Compbell-Hausfeld Co. 151 Railroad Ave., Harrison, Ohio

CAMPBELL-HAUSFELD



More power, beautiful styling New Festures. Still World's Lowest Priced Car Drive of for the a week Rider agents wanted. Earn your own car. If no dealer hear you send 25c for 32 page picture book with full details and dealer price Or send \$1 crefus on Birst ander for 11 6 and serv ice Manual, plus Regair Margal, plus 1 - 5x - photos of carand factors.
MIDGET MOTORS CORPORATION, Athens, Ohio

QUICK-WAY SAW CO. 234 Tempkins St. Centie

ADD PERMANENCE

WITH SCREWS and BOLTS

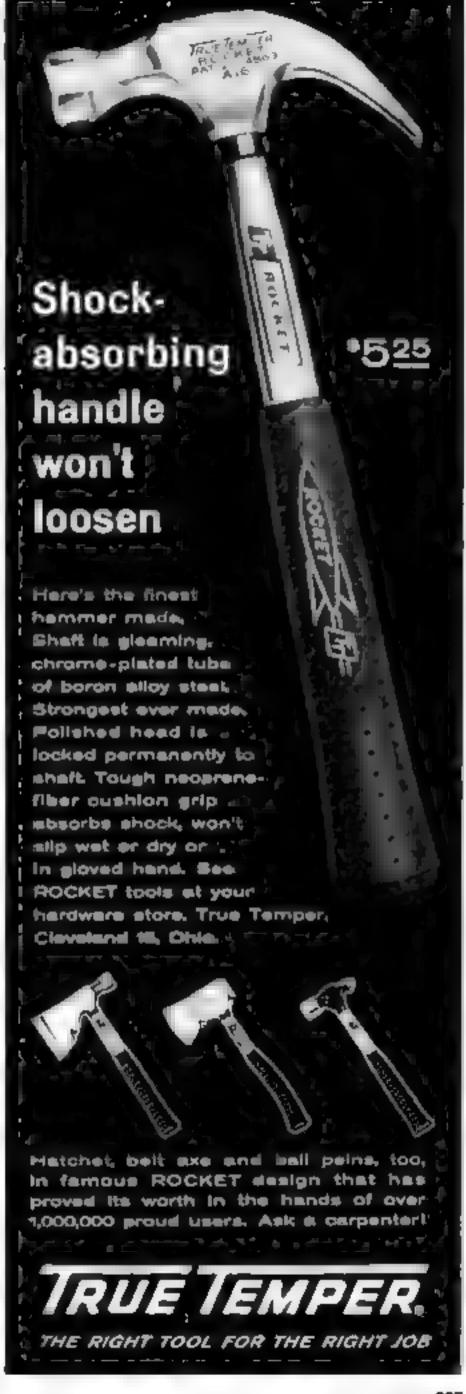
Buy Southern by Name Buy 'em by the box, and save! IN ALL LEADING HARDWARE

AND BUILDING SUPPLY STORES

TAPPING SCREWS STOVE BOLTS MACHINE SCHEWS DRIVE SCREWS CARRIAGE BOLTS MANGER BOLTS

WOOD SCREWS







PAINTING'S REEZE RED HEAD

Juhnesa

SPRAYER

See Your Doubles

complete.

kii losa

New Red Head takes the drudgery out of painting furniture, fences, siding! Cuts painting time up to 85% or more! Assures perfect results every time"

Perfect, too, for insecticide fogging, garden apraya, waxing, greasing, inflating, cleaning -bas 101 uses around home, shop and farml

Outperforms Them All—even many large

1/2 hp units! Red Head compressor is the most efficient ever built! Delivers clean, oil-free air at 3.5 cfm and 50 psi pressure! Plenty of power even for heavy porch and deck enamels and multi-color paints! Portable, compact - only 10" high, weighs under 30 lbs.! Uses any ¼ hp or larger motor.

> Write Teday for Catalog and Introductory Offert 37 other models, from \$30.

> > JOHNSON SERVICE CO. DEFT, M. MILWAUKER 1, WISCONSIN

How to Boost Your Test Score

word or statement that turns a statement false even when most of it is true. "Many pioneers died in Death Valley where the climate is bot and humid" is true right up to, but not including, that last word Mark it false!

Is it better to skip or to guess blindly? On tests where you are simply credited with the total number of right answers. by all means guess. But most tests are scored so that you tend to break even by blind guessing. Time permitting, you've nothing to lose. The ones to beware of are those that aubtract heavily from your total of right answers to penalize you for guesses that turn out wrong

Actually, most people will get six out of 10 right even when they think they are guessing wildly. Unsuspected knowledge and subconscious logic put the guesser that much ahead of the cautious skipper.

So the try-everything testee usually comes out ahead. That's why the sporting approach helps.

As you become a master of testmanship. you'll score higher on tests, perhaps higher than your knowledge entitles you to. But for better or worse, tests are here to stay and knowing how to cope with them is one of the arts of modern living. END

Now how test-wise are you? These questions refer to the picture on p. 127 (don't look back now). Skilled testmen can reason out many answers even if they failed to observe some details in the picture. Answers below.

- 1. Which one of these things can be seen in the picture?
- A) a telephone
- B) an imtraled belt buckle
- C) a list of names on the blackboard
- D) a briefcase
- E) a calendar with one date circled
- 2. The man in the light suit is
- A) holding a pencil in his left hand
- B) smoking a pipe
- C) holding a slide rule in his right hand
- D) pointing to the blackboard
- E) opening a loose-leaf notebook
- 3. The secretary in this picture
- A) wears no jewelry
- B) has a light-colored dress
- C) is writing in a loose-leaf binder
- D) wears a short-sleeved dress
- E) is looking at the blackboard
- 4. The man who is smoking a pipe is also
- A) pointing to a statistical chart
- B) leaning on the table
- C) wearing a bow tie
- D) writing on the map E) wearing rimless glasses

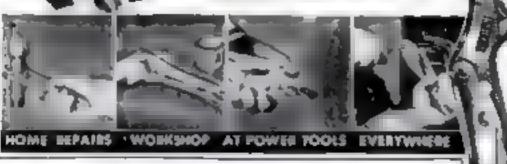
g + .g-g : y-z : g-l : stantuy

We're Giving \$4200

TO FOLKS WHO KNOW HOW MANY JOBS VISE-SRIP CAN DO

SAYS BILL PETERSEN.

PRESIDENT, PETERSEN MFG. CO



Quality tool manufacturers can always be found in POPULAR SCIENCE MONTHLY

Imagine asking you how many jobs Vise-Grip can do! But here's a tool so handy, even me don't know all its uses. So every month through October, we're mailing checks for \$200, \$100, and \$50 for the longest, practical list of uses. (And the winners' favorite tool dealers win the same amount!)

If you don't yet own one, try the new Vise-Grip with Easy Release at your hardware store. See how it locks onto work-by a hand squeezo -with 2,000 lbs. pressure! Releases with bushbuttom ease. A whole tool kit by uself. Wrench, pliers, clamp, vise, wire cutter. A whiz for home repairs, workshop, car, hunting, boating! 7" and 10", \$2.15 - \$2.95.

Simply write your list on a plain sheet of paper with your name and address, and mail to address below.

MOTE: Decision of judges is final. Winners and nonneed on request, All emifies become property of Petersen hits. Co., for in event of the full amount of price that for will be awarded such lying contestant. This cubiast open only to residents of U.S.A. and theritarial passessions. Subject to federal, state and local regulations.

PETERSEN MFG. CO., Dapt. P3-5, DaWitt, Nahr.

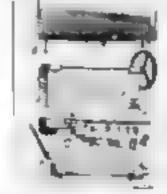


You can turn one tool into twenty-four

Black & Decker



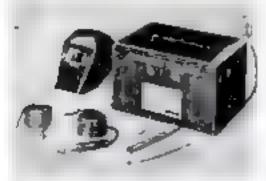
MAGIC SWITCH **ATTACHMENTS**



Pasadena 31, Calif.

METAL

Brakes form angles, locks, pans, etc. Quick eccentrio clamp All steel construction
15° 16 mage steel \$28.00
16° 22 mage steel \$37.00
48° 24 mage steel \$52.00 1 E 00 317 50 Floor stand 24 ga ue Folder 16" I'm and Bes brake 54 x 3 Adminable Bender 16 mings 7" hepch Shenr 3 add, sauge \$15.50 Electric Shear 34" reach \$48.00 DRDER DIRECT OR SEND FOR FRES CATALOG WYKE MFG. CO., 91-4156 Jacon \$1., Denver 18, Cale.



YOURSELF WELD

Weld, Cut, Braze, Solder, Iron, Steel, Braze, Bronze, Aluminum and other metals safely and easily Make your wrought iron furniture, porch railings, fences, knick-anacks and other metal specialities. With this fine equipment anyone can do professional like work with little practice. The Dynamic is an industrial type transformer are walder designed to operate from any properly wired 110 vott AC line.

Order your Dynamic Industrial type transformer Arc Welder for Workshop or Industrial was today. Order from this od.

Literatura en larger equipment avallable na request.

DYNAMIC WELDER COMPANY, 1808 S. Federal Street, Dept. 83-E, Chicago 16, Illinois

down-payment

Pay as you wold. Money buck guaranles. Complete outfit.

Only \$38.50 F.O.B. Factory

MAY 1958 Z39

Bore 35 standard holes with just one tool

New IRWIN Expansive Bit

lets you dial your size

Just turn the dial and you're set to go with this new Irwin Expansive bit. No hunting for the size you need. Fits all hand bit braces. Clean, fast, accurate boring action from \$5" to 3"—35 standard hole sizes in all!

And what a really fine precition tool to own. It's dropforged from special bit steel, heat treated full length, machined for accuracy and sharpness, highly polished, too. Two cutters supplied with each bit. Model No. 21 with %" to 1%" boring range also available. Ideal for home handyman, professional woodworker, or farm See your independent hardware dealer soon.

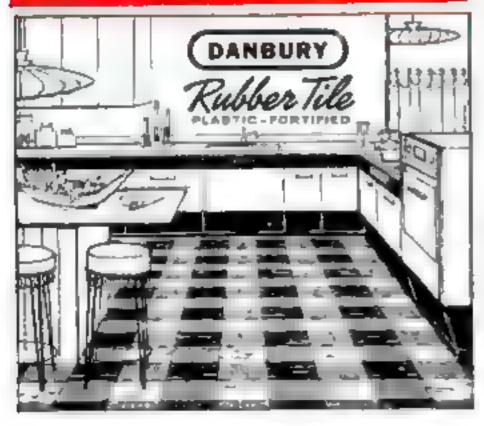


IRWIN

Wilmington, Ohio

the original solid center augus bit e screw drivers

screw driver bits



Beautiful Floors - Always!

Because it is plastic-fortified Danbury Rubber Tile remains lastingly beautiful — dirt and grime stay on the surface where they can be easily cleaned away.

FREE! Write for the Danbury Floor Pattern Planner and Installation Guide.

THE DANBURY RUBBER COMPANY, INC. Flooring Division—Danbury, Connecticut

The B-47 That Couldn't Come Down

[Continued from page 134]

would be a flat 91,000 pounds. With her wheels up, the B-47 would come in fast and stall out at a hot 105 knots.

They were opposite the end of the runway now, turning into final. He popped the approach chute and the airplane bucked and slowed.

Gradually, he bled off speed and altitude. He wished he had all of his instruments. The B-47 is partly blind when trimmed for landing, so he had to fly it partly "on the gauges." But when the canopy jettisoned, he had lost his inverters and thus all his gyros. He rolled the sleek giant out of her bank by "feel" and headed down the groove. The foam was a sickening white in the bright morning sunshine.

Suddenly, the right wing dropped. At approach speed, he dared not try to hold it up with more opposite rudder. He quickly cut engine No. 1. That would equalize the drag of the dead No. 6. He had only four good engines now.

He was within 100 feet of the concrete and flying fast. Already, the fire trucks were moving toward him

Too much was happening at once. He reached desperately for the shut-off switches. They clicked into position and he knew that in seconds the B-47 would be a lifeless thing. The switches had cut off fuel, oil, generator, and hydraulic systems.

Gently, gently, she came down. Then, her engines starved, the B-47 lurched to earth.

Dupras hauled back on the yoke, fighting to slow her fall. He tried to reach the alarm bell. He poured his mind and body into the one final act of flaring out the big bomber that had stalled out too high.

From behind, Joe Fearno barked, "Brace yourself, Ed."

7:31 AV way back in his guts. Then she hut—hard. Dupras popped the brake chute, but the plane barreled ahead, the concrete ripping at her belly. Flames shot out and licked up her sides. But the foam did its work. The flames flickered faintly and died.

Bob Dupras, out of habit, stomped on the brakes, but the B-47 paid no heed and

WAR SUMPLUS BIGANTIC FXCISS SAYE-10-70% BANKEUPT STOCK MODERN DIAL PAGE

to 12-V BATTERY WINCH



6 New powerful ball-bear ing gear reduction winch Built to reverse switch for instant reverse 1 MM-2000 instant reverse 1 100-20
th put Maids up to 40
L'4" cable For week trucks to La" cable boats truck 50 lbs. Co For Weeckers trailers sie Covt. 549 95 FOR

ERRIGATION PUMPS 21/2" size . . . 18,800 gph Dirand new all bronse ball bearing centrituge pump Ideal small farm and carrier teregation, many (Adustrial



2.5" thier. Capacity to 280 gpm. Pressure to 65' Speed 1200 1700 Land 3, to 5 HP motor, 5 as 10'sli'sw' d' pulley 2' out let Wt 40 lbs Govi cost \$100 SALE

HYDRAULIC EQUIPMENT BARGAINS

Bovings to 50% Bull loaders, diggers presson ste All brand new 6 Hackbawk Hand field, System \$23.95 FOR 6 . onical Valve, 1 or 2 way 15.00 field Tractor Pump 1000 osl

12 right 48 for pal 12 v Motor & Patting | 100 pal 13 v You 0 2 Way Cyl 132" bore 6" stroke 4 69 Pud Other Upper stars and Rema Free catalog

TELEPHONE

phone content main line or priextension vate system Complete with ringer that heady to use. Works on any system except rural value \$25 SALE \$3 35 Ppd

POWERFUL MATTERY MOTOR

Oldred for golf or midset car Use 6 or 12 v muto hattery Out-out speed 25 to 80 rpm (12 to 212 HP Geared 140-1 Easily 22-2 HP Geared 140-1 Easily

reversible 1005 uther uses. 145 tong that 7 Share \$4" Wt 33 Its new east \$250 SALE

HYDRAULIC TRANSMISSION



on Calbun Art

Torch and at CESCOPE Namedo all mortal

Craft wast.

 Hand where gives infinite several control from 0 to recontrol from 0 to recontrol from 0 to recontrol from 1 to the control

and seved files for my line

and seved files files for my line

and seved files · Hand wheel machines father wide of lugh W 30 be

ovi co-1 84 10 SALE 549 50 FOR 1.2" long 6"

OUTSTANDING SURPLUS BUYS 4 Main) Crack F on Worrs Shackey

List dangle Harmonk Test

1 Craft States Mr Compressor

1 Table Samp We dog Lementor

1 harm Level Triped Red etc

2 Main Black De Leien Semerator 63 89 Ppd 6 95 Ppd 19 95 Ppd 14 95 Ppd 23 88 PDB 42 85 Ppd 55.00 Ftp SPECIAL OF THE MONTH! 3000 WATT AC PLANT



 New, unused, 3000 w 115-r
 e At' power plant with 4-cylinder water cooled Hereuies engine Past, hutton starting. recently awarded these popular M 5 plants

by a Naval Supply beput and are passing the savings on to 1 m. 48" noise 20" wide, 20" and, 20" wide, 20" \$329.95 FOR

Transformer f a 115 2:0-r power...

\$27.95 FOR

ELECTRIC WATER PUMP

Brand new h. capacity small centrificati Operates on 12 or 24 volts At or Dt. ha, bearing exp. asing proof mater up to 3 gam 77a. Outer 1 Oc Wt 7 the Excelent bigs pump cellar death, water d space etc. at least \$64 8.41?

HUNDREDS SURPLUS BARGAINS Amazing surplus buys, thousands of valuable items-mechanical, electrical, bydraulic hardware, tools sporting goods Send postcard for big new 1958 catalog Send check or M O, Money back

guerantee BURDEN SALES COMPANY

627 West "O" Mr., Lincoln, Nebruska

OLDER

Acciaimed by thousands of Homeowners Mechanics and Hopbylets as the wesder of 1991 same. Eastly operated from properly serial all ton At or Di lion. The ideal wift with a life-long use Order loday on literay money hack guarantee.

FOUR-WAY WELDER CO., Dept. 73-E 1810 S. Federal St • Chicago 16, III.

at a price YOU can conford



M xes while transporting # Dumps hydraulically * Attaches in minutes * No holes to hore . No gears . I or 1 1/2 bag capacity * Eliminates wheelbarrows . Unconditional guarantee . For complete FREE folder, write

UNIVERSAL PULLEYS COMPANY

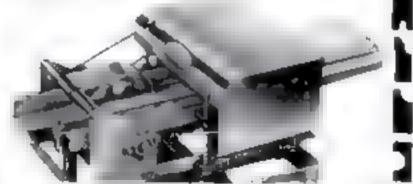
SAVE \$10.00 ON 4/4"

Requirely retails for \$22.00 Your east \$12.05 Pet part La est model, bound new, Poly magnaticed finish NPS \$7.1 k 1.1 For \$5 amproves there has unlikely with a part of the pa or Money onler to:

BRANT FAMIS, Dept. 73, Tonowande, K. Y.



NEW BELSAW MULTI-DUTY POWER TOOL



Now you can use this DNE power-feed shop to furn rough lumber into moldings, trim flooring furniture. All popular patterns. MOLD separately or all at once with a one HP motor. Use 3 to 5 HP for high speed output. Fully Sale guarded. Low Cost. You can own this power fool for only \$30 00 down payment.

Write TODAY for Free Cotalog BELSAW POWER TOOLS, 928 Field Bldg., Kansas City 11, Mo.

10"TILT/ARBOR SAW

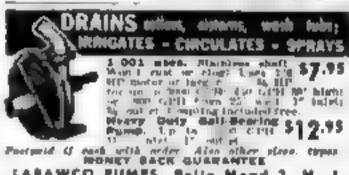
Sturdy wood steel and a minimum construction, NEW INFARTURE of bearings tapen is still self-struction, and the Flank, all main parts in his with 100 comb blade \$23.50, less blade \$22.50, P D & St. Lou & Delati PLANE-PATTERNS and all 00 postsaid

Build-it-powerell 12" and 18" Beridtown, 6"
Sealed Power's

NEW STAINLESS STEEL OIL RING controls oil...stops smoking...

as no other ring can!

U. S. PAT NO. 2 789,872



LABANCO FUMPS, Bollo Mond 3, H. J.

WATER SYSTEM Compiletely Automatic 49.95 Philippe With As HP Bronse and Pump 7.5 GPH 20.40 Ins 34° PHINGS. Free Circular

Automatic Saw Set ...

MAKE EXTRA PROFITS! Set 400 teeth per minute on hand or

band saws, 4 to 15 point, with the 8eMaCo Automatic Saw Set. Fast. accurate, true hammeranvil action sets teeth unc-

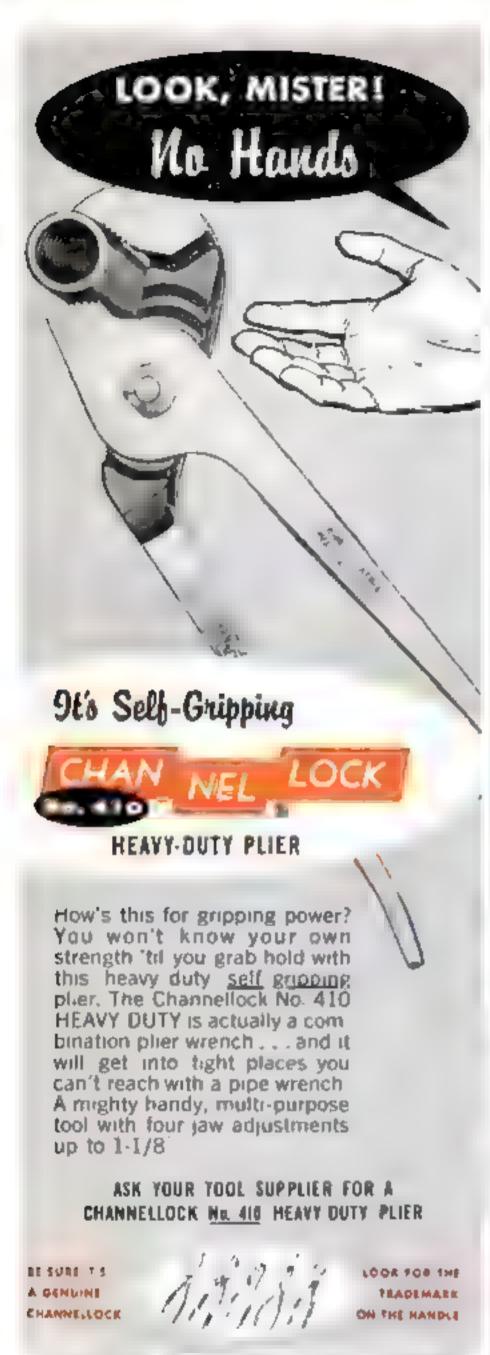
formly, eliminates tooth breakage. Used profitably by saw shops and manufacturers everywhere. Every machine positively guaranteed!

Write for details - today!

Saw Machine Davision

BEAVER MFG. CO.

#00 ISIS AVENUE . INGLEWOOD, CALIF. 34-S



CHAMPION DEARMENT TOOL COMPANY

MEADVILLE, PENNSYLVANIA

242 POPULAR SCIENCE

The B-47 That Couldn't Come Down

skidded on. Now the fire trucks were screaming in, Behind them came the ambulances.

Exactly 28 seconds later, after skidding 2,200 feet, the big plane ground to a halt.

Joe Fearno scrambled out of the cockpit, climbed up on the wing and ran out toward its tip. Dupras followed. At the same instant, Wieland blew his safety hatch and slid down the nose.

In 15 seconds, the fire trucks had skidded to a halt beside the plane and covered the engines with foam. The flight was over.

The B-47 came to final rest outside the 544th's maintenance hangar. The maintenance chiefs who studied the landing gear found that a broken lock-pin had jammed the main gear. It was the first time in the history of the B-47 that the piece had given trouble.

Next day, Sept. 6, Capt. Dupras was recommended for the Distinguished Flying Cross, and Lt. Fearno and Capt. Wieland were recommended for Air Medals for "superb airmanship and exemplary conduct befitting the crews of the Strategic Air Command."

Next day, also, a wingmate said to Dupras, "What the hell, if you guys were so hungry, why didn't you eat the food in the survival kits under your seats?"



end of an ordeal: B-47 No. 52220—her 45 tons back on solid ground and coated with fire-smothering foam—after the wheels-up belly landing at Little Rock Air Force Base.



SAW SHARPENING IS EASY

Super Fi or No. 11 joints and sharpens hand and circular saws 6" to 10" with all teeth correct in height depth pirch birsh bardened steel rotter, teeth are finished flow runs \$9.95 true with no side pull In \$9.95

"TRU-CIRCLE" saw set automat-

at 10" to 05 OF In Own.



DOWEL CENTERS Lentes tracethe exact neption for d p p o a ste hules l'urs fur s a a a te hairs. \$1.40 ppd. |

SUPER SAW FILER NO.

Au ama teal y protection design and the protection of the prot e an made ti may vise i clamp. Includes

56.50 ped. MONEY BACK BUARANTEE-CATALOG FREE

D. McBURNEY, 5908 Hellywood Blad., Hallywood 28, Col., Bept. 3-58



DIVING INDUSTRIES WILMERDING, FA.

RETAIL PRICE \$125 00

FACTORY TO

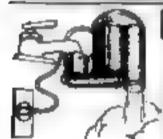
SUPERSHOP includes precisionbuilt \$" lifting table saw, vertital and horizontal drill press, 30" lathe, sander, grinder. 100% BALL BEARING. Write for FREE totalog, full details, trial plan.





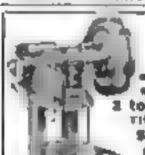
207 YATES AVE.

BELOIT, WISC.



chaten out water for just people for just of Mississian the Mississian of Mississian to Just the American fleater over any fautet plug it the American expense of the mississian of the street of the mississian of the street of the mississian of th act any price

Sand 10c for 100 page Catalog-FREE with order Prices to b. Inchery Send check or M.O. CO., Dept. 6-56, Burlington, Wis. MASTER MECHANIC MFG



Duty Bench Type PUNCH PRESSES

Model B-2 ton - 587.50 Titting model \$127.50 fatt tras meter 164 DiRecent

Hedel Combination

1 to 5 for capacities

Moderate in price
Fo by guaranteed

See print think, data as wells

to be eath of the room
eto of man in and art ex on
our Bench Type Punch Presses

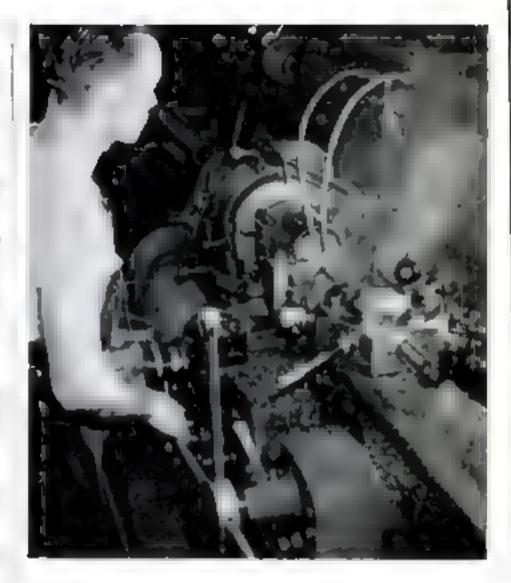
ALVA ALLEN INGUSTRIES, Dept. PS, Ciroton, Mo. !

Handlest drill bit made. Use on any Handlest drill bit made. Use on any electric drill, lethe, drill press, etc. Made of finest American hi speed ateel. 31,7 long, 1,4 diameter Bas 2" ande-cutting section. Cuts steel wood plastic, aluminum etc 3 types specify types wanted. (1) All purpose, (2) Wood (3) Heavy metal \$2.45 each - 3 for \$7.00 Postpaid Money back guaranteed. Buy from your dealer or send theck or Money Order and name of favorite tool Order and name of favorite tool dealer TODAY, (Makes Meal gift.)



Jobber & Dealer Inquiries Invited

BEAVER DEJUL & TOOL CO., 3000-A McGae Trafficway, Ramons City, Mo.



Production + Precision SOUTH BEND **Turret Lathes**

- Ideal for small precision parts and critical second eserctions.
- Ruggedly built to hold their accuracy through years of service.
- Responsive and easy to handle.
- Rigid for vibration-free eperation.
- More usable newer.
- Exceptionally wide ranges of spindle speeds, power turret feeds (handlever feed only on 10° inthes), througing foods, longitudinal and cross feeds,

SPECIFICATIONS and PRICES

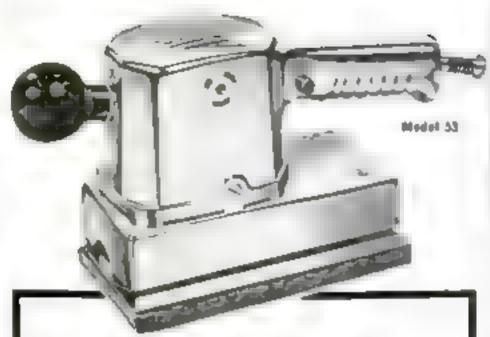
Torret Lette Medal	10"	33"	2-H
Swing over bod	10%*	13% "	16% "
Collet capacity	11/6"	156"	114"
Spindle hore	196 °	196 *	134 "
Turret feeds	hand	244	144
BASE PRICE	\$1748	\$2560	\$3658

Write for cutulog on all 3 sizes.

SOUTH BEND LATHE SOUTH BEND 22, INDIANA

Building Better Tools Since 1906





The Secret of

Ask any expert—the secret of a perfect finish is to sand with the wood grain! That a what the old-time craftsman did when he sanded by hand And so do you when you use a Dreme! Straight Line Action Sander—except that a powr ful matter does all the work.

With Dieme! Straight-Line Action, you leave no cross—grain scrain; so or orbital swirt marks to mar the finish of your orons.

or your project.

Dremel as ders are compact lightweight and easy to grip and handle Don't be tooled by not alikes or llooks as me Ask your dester for a demonstration. Then compare their price, performance, and ease of handles You're sure to pick a Dremel and you'll be glad you did

See Your Fower Tool Dealer Index Dremel Stroight-Line-Action Power Send-

ers—3 popular medels—\$14.85 to \$37.50 FREE Power Test Catalog on the Campiese Dremet Line, Write today

Quality Power Tools Since 1934 DREMEL INFO. CO., Dape. 1286, Buclas, Wis.





SAVES PLUMBING

5 HB 3600. May but Just introduced at a 3 he Hockief sha New D spore is which enables In It me Owe it Jame of or hactory Main tenime to e an age Clouden Newer Brain Flushing Con with the mass a pressure on a war what of water counting the most at the tern departer up to 2 for Tight TS SANKS UNINGLE RATHET HE FLOOR DIGHTS and Hell SE TO STHEFT SEW FIN : said is the totease Rage Sand Bests. intell pager to drawar install a site in a last There is a beed remove was expired Orease Trup A special attachment a loss water to flow from the four of through the term while a racre eased on the pipe. Venta or stacks are no obeta to us force entries o what is the Product Fig. 12 from with a COSTLY PLUMBING BILLS SAVED?



The New Outboards

[Continued from page [r-1]

that stops the engine when it kicks up out of water to keep the prop from running wild, then restarts it when the prop returns to operating position. Test motors have been driven over floating telegraph poles and sand bars at full speed with no damage or loss of steering control.

Both Johnson and Evinrude use a single twin-harrel down-draft carburetor. A thermostat maintains proper temperature in

the cooling system at all speeds.

The V-4s are available with either manual or electric starting. In the electric version, a switch key lets you lock the motor so it can't be started by anyone else when you're away.

Debut of a diesel. Also new this year is a revolutionary diesel outboard introduced by American Marc Inc., Inglewood, Cal. So new is this power plant, in fact, that details are available only on a 7½-hp. model, although the company plans to

produce 15- and 22-hp. motors.

The 7½-hp. model has a displacement of 18.5 cu. in. It is a two-cycle, crankcase-scavenged engine that is typical diesel in some respects, but unique in other ways. Like a diesel, it is simple to maintain because it requires no carburetor. magneto or spark plugs. It is inexpensive to run (two quarts fuel per hour at full throttle) and has less fire hazard because it burns low-cost, inert diesel oil.

But unlike most other diesels, it has an unusual method of precombusting the fuel, which does away with conventional, bulky diesel combustion chambers, and a novel arrangement of opposed-firing pistons in a single cylinder. These unique features keep both weight (80 lb.) and size unusually moderate for a diesel. Price: about \$325.

On the foreign front, one of the most interesting motor lines is the British Seaguil, imported by various agents in the U.S., among them the Sea Bright (N. J.) Marine Center.

All Seagull motors—which range from 11/2 to five hp.—are lightweight, smoothrunning, single-cylinder power plants with large reduction gears and big, slow-turning, four-bladed propellers. These ponderous props provide steady thrust that is perfect for driving such heavy, comparatively slow displacement craft as keel sailboats and househoats.



easy to use.

and purspe.

Socie fame, money and replacement parts

Do year own experts, construction and

metal fabracation fideal for these quick

money-meking jute around farms, ghops

Write HOBART Brothers Co., Box F-58, Troy, Ohlo, Phone FEderal 2 1223

O

WELDER

Save \$300 to 5500

as not from brenkle. Weldor's Vest Focket Guide

10

eghtv

with angine

of the " he is middle

time little at Asid getteration

for 116V or 220V

Just the thing for the home

workshop Just plug it us. Not

a toy but a not easy to use,

very low cost welder.

[Continued from page 106]

(While the A-bomb will have made the dust radioactive, a tiny amount sufficient for analysis should be no problem on that score.) The second rocket will then use auxiliary jets to move it back into a trajectory that will return it to earth.

The returning rocket will move into the earth's atmosphere at high altitudes, and then the flight path will be depressed 10 degrees to the horizon. Since it is moving at about 35,000 f.p.s., the moon rocket would risk incineration, and to prevent this some novel way of ejecting the instrument capsule may be devised.

Perhaps the capsule will be coated with an unusually heat-resistant plastic such as Teffon (as has been suggested by Dr. R. W. Porter) so that the heat could "boil off" the Teffon without burning up the capsule. Or perhaps deceleration jets will be used. After the capsule has decelerated to a nominal speed, parachutes could be used to land it. A small radio transmitter in the capsule can emit a signal to help locate the fallen capsule. That is one way of recovering physical data from the moon, though at this moment the problems are of staggering complexity.

2000: Man on the moon

The last step, putting a man on the moon, will take a long time. It requires the erection of a full-scale space station to circle the earth at an altitude of at least 1,075 miles. At this space station the necessary materials can be assembled for the man-carrying moon rocket.

One reason for the space station is that, orbiting the earth, it has a speed of almost 4.4 miles per second (15,840 m.p.h.). An additional speed of hardly more than one mile per second is needed to pass from the preponderance of the earth's gravitational field into that of the moon's. Including the additional tasks of braking for a moon landing, and taking off again, the total performance required of a rocket in a space-station-to-moon round trip is less than for a trip from the earth to the space station!

The manned vehicle will not look like a conventional streamlined rocket. This one will take off and land on places with no atmosphere, which makes streamlining unnecessary.

Leaving the space station with a speed

of about a mile a second, the rocket heads for the moon. It will reach a point, 23,600 miles from the moon, where the gravitational fields of the earth and moon balance each other. The manned rocket will then begin its descent. Because of the practical lack of an atmosphere, rocket power alone must brake the fall.

Once man has set foot on the moon, data previously obtained in a rough way with his robot rocket can be definitively checked to determine the density and composition of any lunar atmosphere. Lunar temperatures can also be precisely determined.

The astronomers will have a field day resolving some of the moon's mysteries:

 What are the lunar rays? Firsthand inspection of these long-unexplained bright streaks on the surface may reveal their nature and origin.

• How did the giant lunar craters come into being? Were they created by volcanic activity, or by the impact of large meteors?

• Is the moon a daughter of the earth? Was the moon torn from the earth by some giant cataclysm in the long ago? Perhaps a comparison of the rocks on the moon with those ringing the Pacific Ocean will provide the answer.

When can we expect these answers?

This writer believes that we will have to wait until the turn of the century. Unless a tremendous amount of money is available—or, better, resources are pooled in an international project—a manned landing on the moon cannot be consummated for a long time. It is unlikely that the space station will be built before 1978. After the space station is finished, years will be needed to plan, build and assemble equipment for a landing on the moon.

Why so much time? Manned reconnaissance of the moon will be necessary to pick the landing area. After the reconnaissance, small rockets will be dropped to the lunar surface to yield information as to what lies immediately beneath the surface in the chosen area. Finally, it will take time to assemble and test the giant moon rockets. Only when this is done will man take off for the moon. When he lands, man's first conquest of space will have begun.

The year will be 2000 A.D.

This one KF8J-2WX-EX5A

Look

AT ALL THE JOBS THIS PORTER-CABLE HAND SAW CAN DO!

It's a . JIG SAW

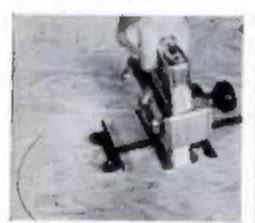
- SCROLL SAW
- . COPING SAW
- HACK SAW
- RIP SAW
- CROSSCUT SAW
- KEYHOLE SAW



Accurately saws angle with Angle-Adjusting Base.



Cuts pipe and sheet smoothly. leaving little burr,



Cuts large inside circles accurately and quickly.



Handy kit mounts on wall or workbench.

Remember: when you SEE what your into a Porter-Cable tool, you KNOW why It's your BEST buy!

- · SAWS
- BELT SANDERS
- FINISHING SANDERS
- · DRILLS
- ROUTERS
- · PLANES

In Canada: write Parter-Cable, Ltd., Sax 5019, Ontario.

Conadian prices slightly higher. In Mexico: write CIA. General Distribuidore, S. A., Av. Oaxaca 50, Mexico City, D. F.



It cuts 2" dressed lumber... 4" aluminum ... " steel. It cuts Plywood, Masonite, Plastics, Plexiglas, Lucite, Rubber, Iron, Asphalt Tile, Brass, Bronze, Sheet Metal, Pipe Bar Stock, Leather, Linoleum . . . !

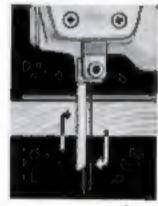
. IT MAKES INSIDE CUTS WITHOUT DRILLING A STARTING HOLE!

*IT CUTS ACCURATE ANGLES UP TO 45°1

EXCLUSIVE ORBITAL ACTION!

The most efficient cutting cycle ever developed. Blade moves ahead and up on cutting stroke...moves back and away on down stroke. It eliminates blade drag, and bladebreaking heat and friction. Blades stay sharper longer. You get up to 10 times longer blade ilfe!

nearest dealer.



Without question, this is the most practical, handiest saw for all-around use in your home, shop or business. And it's the best-made because it's a Porter-Cable. You know that!

Model 152 "7 in 1" Electric Hand Saw Only \$54.95 (Handy wall kit with accessories, \$5 extra.)

SEE	YOUR	DEALER	TODAY	500	WRITE	Ente	CATALOG
-		the state of the s	IVENT	3475	TALLE	F-12-M	Laborate United

Porter-Cable Machine Co. 8155 Marcellus St., Syracuso 4, N. Y.

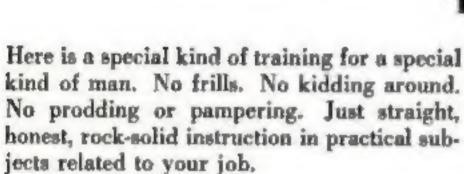
D Please send complete information on your No. 152 Electric Hand Saw, and the name of my

Name			_
Address			_
City	Zone	State	

MAY 1958 247

"BLUE CHIP" TRAINING

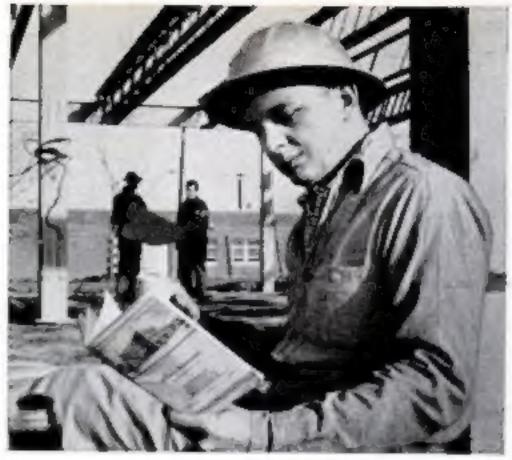
-for the man who can take it hard and fast



And it comes to you fast as you can take it.

This is training with a high "cash value." "Blue chip" companies by the hundreds recognize its worth, boost I.C.S.-trained men into better jobs, promote them faster, place them in positions of responsibility and prestige.

For Real Job Security-Get an I. C. S. Diploma! I. C. S., Scranton 15, Penna.



If you missed out on a college education . . . if you have money problems, a job to hold down, a family to support, then you're right to train with I.C.S. No other school has so many of its former students now in supervisory and management positions!

But remember-it takes a special kind of man to learn while he earns, the I.C.S. way. Don't mail the coupon below unless you're ready right now to say, "Prove to me you have what I want. I'll prove I can take it!"

Accredited Member, Hollenal Heme Study Council

INTERNATIONAL CORRESPONDENCE SCHOOLS (Portial Sal of 257 courses) BOX 72314E, SCRANTON 15, PENNA. Without cost or obligation, sand me "HOW to SUCCEED" and the opportunity booktel about the field BEFORE which I have marked X (plus sample leases); ☐ Good English ☐ High School Mathematics ☐ Short Story Writing ☐ Industrial Electronics ☐ Practical Radio-TV Engir's ☐ Practical Telephony ☐ Radio-TV Servicing AVIATION Aero-Engineering Technology Aircraft & Engine Mechanic ARCHITECTURE CIVIL ENGINEERING MANUAL DESIGNATION OF THE PERSON OF THE PERS CONSTRUCTION Civil Engineering Construction Engineering Highway Engineering Professional Engineer 6 Reading Struct. Blueping Structural Engineering Surveying and Mapping BUSINESS Accounting Advertising Business Administration Business Management Air Conditioning Construction Engineering LEADERSHIP Highway Engineering Professional Engineer (Civil) Reading Struc. Blueprints Architecture Industrial Foremenship industrial Foremanship Industrial Supervision Personnel-Labor Relations RAILROAD Car Inspector and Air Brake Diesel Electricies Arch Drawing and Designing Building Contractor Building Estimator Supervision Surveying and Mapping Diesel Engr. and Firemen Cost Accounting Creative Salasmanship Managing a Small Business MECHANICAL Corponity and Millwork Diesel Locompline PRAFTING and SHOP Diesel Engines Carpentur Foruman Aizeraft Orolling Lighting STEAM and DIESEL POWER Combustion Engineering Professional Secretary Interior Decoration **Architectural Drafting** Gas-Elec. Welding Industrial Engineering Public Accounting **Drofting Machine Design** Painting Contractor **Purchasing Agent** Industrial Instrumentation Industrial Metallurgy **Electrical Drafting** Plumbing Plumbing Beding Arch. Blueprints Salesmanship Salesmanship and Power Plant Engineer Mechanical Drafting Stationary Dieset Engr. Commercial Art d Martal Drafting Industrial Salety Management Stationary Firemen Structural Drafting Machine Design ☐ Truffic Management Machine Shop Practice Magazine & Book Illup. TEXTILE CHEMICAL ELECTRICAL Machanical Engineering Show Card and Carding and Spinning Cotton Manufacture Cotton Warping and Weaving Analytical Chemistry **Esectrical Engineering** Sign Lettering Sketching and Painting Professional Engineer (Mech) Chemical Engineering Chem. Lab. Technicies Elements of Muclear Energy Elec. Engr. Technician Elec. Light and Power Quality Control Reading Shop Biveprints Reading Shop Blue Refrigeration and Loom Fixing Tuchnician AUTOMOTIVE Practical Electrician Textile Designing Textile Finishing & Dyeing Automobiles General Chemistry Natural Gas Prod. and Trans. Practicel Linemen Air Conditioning Tool Design | Tool Making ☐ Auto Body Rebellding Professional Engineer (Elec) Throwing and definishing Petroleum Prod. and Engr. HIGH SCHOOL High School Diploma RADIO, TELEVISION General Electronies Tech. Warping and Weaving Worsted Menufacturing Avio Engine Tuneup Auto Technicien Professional Engineer (Cham) Pulp and Paper Making A.M. to P.M. _Working Hours____ Canadian residents send coupes to Intersectional Carrespondence Schools, Canadian, Ltd., Occupation. Montreal, Canada. . . . Special bettion rates to members of the U. S. Armed Forces.

Superior's New Model 70 UTILITY TESTER®

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS - AUTOMOBILES - TV TUB



As an electrical trouble shooter the Model 70:

- · Will test Toasters, Irons, Broilers, Heating Pade, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lomps, Fluorescents, Switches, Thermostats, etc.
- Will test all TV tubes for open filements, inter-element shorts, burned out tubes, etc.
- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, Lonkage, etc.
- Will measure current consumption while the appliance under test is in operation.
- Incorporates a sensitive directreading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.
- Leakage detecting circuit will indicate continuity from zero ohms to 5 megohms (5,000,000 ohms).

As an Automotive Tester the Model 70 will test:

. Both & Volt and 12 Valt Storage Batteries . Generators . Starters . Distributors · Ignition Coils · Regulators · Relays · Circuit Breakers * Cigarette Lighters * Stop Lights * Condensers * Directional Signal Systoms . All Lamps and Bulbs . Fuses . Heating Systems . Horns . Also will locate poor grounds, breaks in wiring, poor connections, etc.

IT'S SO EASY!!



With tester's cord in acties, cur-rent rememption of appliance in read direct on meter sten line cord is connected to receptacle on cord is contested to receptacle on panel. This typical iron takes T amperes (Good)



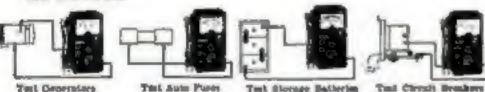
Control circults of most furname use he ruite nivisited from step-dums transformer. Here's how to check roofs theresocial to see it wirds to it are live.



all electric for motor technologies (marms recotance).



Manual supplied with Medel to ahous meter needle moves to right when test leads are supported to plus 2 and 4 of this \$4.50 tube. pins 2 and 6 of this 64.06 late. Procedure for testing all tubes used.



READ THIS!





This 64-page book-practically a condensed course in electricity. Learn by

Just read the following partial list of contents:

What is electricity? . Bimplified version of Ohms Law . What is wattage? . Simplified wattage charts . How to measure volt-

City of the publical

leakage a How to test all electrical appliances and motors using a simplified trouble-shooting technique.

- How to test all TV tubes; also simple procedure for determining which specific tube (or tubes) is causing the trouble.
- How to trace trouble in the electrical circuits and parts in automobiles and trucks.

Model 70 comes complete with above 🕏 book and test loads. Only . . .

READ THIS?

You don't pay for the Model 70 until AFTER you have examined it in the privacy of your home! Model 70 is

NO MONEY WITH ORDER — NO C. O. D.

Try it for 10 days before you buy. If completely satisfied then send \$3.85 and pay balance at rate of \$4.00 per month for 3 months - No Interest or Finance Charges Added! If not completely satisfied, return to us, no explanation necessary.

	ONIC DIST. CO. 3849 Tenth Ave., New Yo	k 34, N. Y.
10 days and 8	one Model 70, if satisfactory alance at rate of \$4 per mant poid. If not satisfactory, I m	h until total price of \$15.85
	para. It not satisfactory, I the	ay retorn for cancellosion by
account.	para. It not satisfactory, I the	ay resort for concentration of
Address	para. It not sammerowy, I the	ay retorn for concentration of

Working on "hot wires" is the job of Joe Gilbert, high voltage lineman, West Covina, Cal. He takes time for a Camel after repairing a 220,000-volt line."Sure feels good to have a Camel," he says. "Plenty of flavor-easy to get along with."



The best tobacco makes the best smoke

The special Camel blend of costly tobaccos has never been equalled. That's why no other cigarette tastes so rich and full-flavored, smokes so mild. Today more people smoke Camels than any other cigarette of any kind. Try 'em - you'll see why.

Have a real cigarette have a CA

R. J. Reynolds Tobucco Company. Winston-Salem, N. C.

TURKISH G DOMESTIC BLEND CIGARETTES